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APPLICATION NUMBER: *10/966,529*
FILING DATE: *October 14, 2004*
RELATED PCT APPLICATION NUMBER: *PCT/US05/02391*

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16623 U.S.PTO 101404

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PTO/SB/05 (08-03)
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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	60399-3
First Inventor	Baron C. Dickey
Title	METHOD AND APPARATUS FOR SPATIALLY ENHANCING THE STEREO IMAGE IN SOUD REPRODUCTION AND REINFORCEMENT
Express Mail Label No.	EL852691820US

APPLICATION ELEMENTS
See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: **Commissioner for Patents, P.O. Box 1450, Alexandria VA 22313-1450**

1. [X] Fee Transmittal Form (e.g., PTO/SB/17) *(Submit an original and a duplicate for fee processing)*
2. [X] Applicant claims small entity status. See 37 CFR 1.27.
3. [X] Specification [Total Pages 39] *(preferred arrangement set forth below)*
   - Descriptive title of the Invention
   - Cross Reference to Related Applications
   - Statement Regarding Fed sponsored R & D
   - Reference to sequence listing, a table, or a computer program listing appendix
   - Background of the Invention
   - Brief Summary of the Invention
   - Brief Description of the Drawings *(if filed)*
   - Detailed Description
   - Claim(s)
   - Abstract of the Disclosure
4. [X] Drawing(s) (*35 U.S.C. 113*) [*Total Sheets* 16]
5. Oath or Declaration [*Total Sheets* 1]
   a. [X] Newly executed (original or copy)
   b. [ ] Copy from a prior application (37 CFR 1.63 (d)) *(for a continuation/divisional with Box 18 completed)*
      i. [ ] DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).
6. [X] Application Data Sheet. See 37 CFR 1.76
7. [ ] CD-ROM or CD-R in duplicate, large table or Computer Program *(Appendix)*
8. [ ] Nucleotide and/or Amino Acid Sequence Submission *(if applicable, all necessary)*
   a. [ ] Computer Readable Form (CRF)
   b. [ ] Specification Sequence Listing on:
      i. [ ] CD-ROM or CD-R (2 copies); or
      ii. [ ] paper
   c. [ ] Statements verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

9. [ ] Assignment Papers (cover sheet & document(s))
10. [ ] 37 CFR 3.73(b) Statement *(when there is an assignee)* [X] Power of Attorney
11. [ ] English Translation Document *(if applicable)*
12. [ ] Information Disclosure Statement (IDS)/PTO-1449 [ ] Copies of IDS Citations
13. [ ] Preliminary Amendment
14. [X] Return Receipt Postcard (MPEP 503) *Should be specifically itemized)*
15. [ ] Certified Copy of Priority Document(s) *(if foreign priority is claimed)*
16. [ ] Request and Certification under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or its equivalent.
17. [ ] Other: _____ _____

18. **If a CONTINUING APPLICATION OR APPLICATION CLAIMING FOREIGN PRIORITY**, *check appropriate box, and supply the requisite information below and in a preliminary amendment, or in an Application Data Sheet under 37 CFR 1.76:*

[ ] Continuation [ ] Divisional [ ] Continuation-in-part (CIP) [ ] Claims priority from _____ application No.

Prior application information *Examiner* _____ *Group Art Unit:* _____

For CONTINUATION or DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 5b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

19. CORRESPONDENCE ADDRESS

[X] Customer Number: 22504 or [ ] Correspondence address below

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Address					
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Country		*Telephone*		*Fax*	

Name (Print/Type)	Brian L. Johnson	*Registration No. (Attorney/Agent)*	40,033
Signature	Brian L Johnson	*Date*	October 14, 2004

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FEE TRANSMITTAL for FY 2005

Effective 10/01/2003. Patent fees are subject to annual revision.

[X] Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT | **($) 1508**

Complete if Known	
Application Number	
Filing Date	October 14, 2004
First Named Inventor	Baron C. Dickey
Examiner Name	
Art Unit	
Attorney Docket No.	60399-3

METHOD OF PAYMENT *(check all that apply)*

[ ] Check [ ] Credit card [ ] Money Order [ ] None

[X] Deposit Account:

Deposit Account Number: **04-0258**

Deposit Account Name: **Davis Wright Tremaine LLP**

The Commissioner is authorized to: *(check all that apply)*

[X] Charge fee(s) indicated below [X] Credit any overpayments

[ ] Charge any additional fee(s) during the pendency of this application

[ ] Charge fee(s) indicated below, **except for the filing fee**

[X] Charge any deficiencies

to the above-identified deposit account.

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee($)	Small Entity Fee Code	Small Entity Fee($)	Fee Description	Fee Paid
1001	790	2001	395	Utility filing fee	395
1002	350	2002	175	Design filing fee	
1003	550	2003	275	Plant filing fee	
1004	790	2004	395	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	

SUBTOTAL (1) ($)395

2. EXTRA CLAIM FEES

			Extra Claims		Fee from below	=	Fee Paid
Total Claims	41	- 20** =	21	x	9	=	189
Independent Claims	24	- 3** =	21	x	44	=	924
Multiple Dependent						=	

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	18	2202	9	Claims in excess of 20
1201	88	2201	44	Independent claims in excess of 3
1203	300	2203	150	Multiple dependent claim, if not paid
1204	88	2204	44	** *Reissue independent claims over original patent*
1205	18	2205	9	** *Reissue claims in excess of 20 and over original patent*

SUBTOTAL (2) ($)1113

**or number previously paid, if greater; For Reissues, see above

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet.	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for *ex parte* reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	430	2252	215	Extension for reply within second month	
1253	980	2253	490	Extension for reply within third month	
1254	1,530	2254	765	Extension for reply within fourth month	
1255	2,080	2255	1040	Extension for reply within fifth month	
1401	340	2401	170	Notice of Appeal	
1402	340	2402	170	Filing a brief in support of an appeal	
1403	340	2403	170	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive – unavoidable	
1453	1,370	2453	685	Petition to revive – unintentional	
1501	1,370	2501	685	Utility issue fee (or reissue)	
1502	490	2502	245	Design issue fee	
1503	660	2503	330	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	
1807	50	1807	50	Petitions related to provisional applications	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	790	2809	395	Filing a submission after final rejection (37 CFR § 1.129(a))	
1810	790	2810	395	For each additional invention to be examined (37 CFR § 1.129(b))	
1801	790	2801	395	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	

Other fee (specify) _____

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SUBMITTED BY

(Complete *(if applicable)*)

Name (Print Type)	Brian L. Johnson	Registration No. (Attorney/Agent)	40,033	Telephone	(206) 628-7670
Signature	Brian L Johnson			Date	October 14, 2004

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METHOD AND APPARATUS FOR SPATIALLY ENHANCING THE STEREO IMAGE IN SOUND REPRODUCTION AND REINFORCEMENT SYSTEMS

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates generally to systems and methods for enhancing the performance of sound reproduction and reinforcement systems and more particularly for enhancing the performance of these systems over broad listener areas.

Description of the Related Art

Since the advent of sound recording near the end of the nineteenth century, an effective methodology has been sought to make the reproduction of sound, especially music, approach as closely as possible the sound field created by the original live source. Challenges remain including increasing the audience listening area in which sound is faithfully reproduced. Sound reproduction system engineering implementations have focused on "electrostatic emitters" which are extremely directional in their radiation response and offer only a single listening location and electrodynamic emitters which have been designed for the uniform distribution of sound energy over a wide area.

Despite occasional announcements that the ultimate perfection has been reached and despite the increased number of separate emitters being utilized to create a theater or high-end home sound reproduction system, fidelity problems remain. Relatively accurate reproduction tends to exist. Unfortunately, it is restricted to central on axis listening positions, which are locations that are equidistant from primary emitters. For other listening positions spatial anomalies distort the associated sound field. With conventional approaches, for listening locations that are off the central axis of the emitters the "stereo image" degenerates. Consequently, for a group of original sound sources, such as instruments being played together, in a live performance the spatial orientation of the reproduced sound sources would not be the same as the spatial orientation of the live performance. Instead, the spatial

orientation of the reproduction is compressed, expanded or otherwise changes relative to the spatial orientation of the original performance based upon listening position. In live performance sound reinforcement installations where emitters are used to reinforce the sound produced by instruments being played and singers' voices, performance frequently declines to the point where the emitters being used become the only acoustic image realized.

Since sound obeys an inverse square law relative to distance, as the distance between emitters and listener increases, the sound intensity decreases. As a result, the sound images that are created by two or more emitters at any listening position not equidistant from both emitters will have a geometry distortion introduced. In these off-axis listener positions, the instruments become crowded together and the instrument closest to the off axis listener becomes louder and the "stereo image" of central instruments rapidly degenerates. The incorporation of a third "center channel" has been tried, but this can add significantly to the system's complexity, and offers limited results.

A number of other devices have been proposed to increase the area in which the audience will experience faithful sound reproduction. Some have proposed the use of frequency sensitive elements to selectively phase shift and redirect the electrical energy to various emitter means. The proposed devices tend to add complexity and degrade the final reproduced sound. Others have proposed devices that attempt to stimulate the listening room utilizing radiation from the emitter without regard to room dependant anomalies such as wave cancellations that occur from reflective walls to produce an improvement.

Further, the industry has expended a great deal of effort measuring the effect of interaural time difference (ITD). This involves the time difference created by the physical path length difference created by the human head and the time differences created by the path lengths from sound source to listener. Various methods have been proposed to compensate for geometric anomalies. In modern recording studios it is common practice to use many microphones and recorder channels to capture a performance. Results can be disappointing since time and phase information that relate one instrument to another can be lost prior to recording

distribution and is usually unavailable to sound reinforcement systems. As a result a less than ideal situation occurs in which differences in loudness of emitters are relied upon as the cues for spatial location to recreate sound image files. The challenge of increasing the audience listening area in which sound is faithfully reproduced remains by in large elusive.

BRIEF SUMMARY OF THE INVENTION

Aspects of the invention include a system for an audience area, the audience area having a near field compensation border, the audience area being adjacent a second area along the near field compensation border, the second area having a first reference location. The system includes a plurality of sound emitters configured to be placed in a first configuration in the second area. Furthermore, aspects include an emitter energy apportioner configured to be coupled to the plurality of sound emitters to send signals to the sound emitters having energy distributed amongst the signals such that the sound emitters being in the first configuration in the second area collectively emit a first sound pattern, the first sound pattern configured to be received having a first sound energy amplitude for at least a first sound frequency by a sound receiver at a first location in the audience area a first distance from the near field compensation border and a second distance from the first reference location with the sound receiver facing the first reference location in the second area, the first sound pattern configured to be received having a second sound energy amplitude for at least the first sound frequency by the sound receiver at a second location in the audience area a third distance from the near field compensation border and a fourth distance from the first reference location with the sound receiver facing the first reference location in the second area, the first distance approximating the third second distance, the second distance being different from the fourth distance, and the first sound energy amplitude approximating the second sound energy amplitude.

Further aspects include a system for an audience area, the audience area having a near field compensation border, the audience area containing a sound receiver having a left channel sound receiver and a right channel sound receiver, the audience area being adjacent a second area along the near field compensation

border, the second area having a first reference location. The system includes a plurality of sound emitters configured to be placed in a first configuration in the second area. Further aspects include an emitter energy apportioner configured to be coupled to the plurality of sound emitters to send signals to the sound emitters having energy distributed amongst the signals such that the sound emitters being in the first configuration in the second area collectively emit a first sound pattern, the first sound pattern configured to be received having a first audible sound information content with a first left channel frequency-amplitude distribution to be received by the left channel receiver of the sound receiver and a first right channel frequency-amplitude distribution to be received by the right channel receiver of the sound receiver at a first location in the audience area a first distance from the near field compensation border and a second distance from the first reference location with the sound receiver facing the first reference location in the second area, the first sound pattern configured to be received having a second audible sound information content with a second left channel frequency-amplitude distribution to be received by the left channel receiver of the sound receiver and a second right channel frequency-amplitude distribution to be received by the right channel receiver of the sound receiver by the sound receiver at a second location in the audience area a third distance from the near field compensation border and a fourth distance from the first reference location with the sound receiver facing the first reference location in the second area, the first distance approximating the third distance, the second distance being different from the fourth distance, and the differences between the first left. Other features and advantages will become apparent from the accompanying detailed description and drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S)

Figure 1 is schematic of a sound image of a sound image system and associated audience zones.

Figure 2 is a schematic of an emitter driving system of Figure 1.

Figure 3 is a schematic showing the generalized presentation of how emitter elements relate to the listener.

Figure 4 is a flow chart of a calibration method for the sound image system of Figure 1.

Figure 5 is an exemplary schematic nonuniform sound amplitude emitted by the sound image system of Figure 1. It illustrates the nonuniform sound amplitude emitted by each of two spaced-apart emitters with the sound amplitude as a function of angle represented by the distance of the arcs from the respective emitters.

Figure 6 is an exemplary schematic of the geometric relationship of two spaced-apart first implementations of the emitted assemblies and the listener audience relationships.

Figure 7A is a side elevational schematic of a first implementation of the emitter assembly of the sound image system.

Figure 7B is a front elevational schematic of a first implementation of the emitter assembly of the sound image system.

Figure 8 is a schematic of a first electrical implementation of the first electrical implementation of the emitter assembly shown in Figures 7A and 7B.

Figure 9 is a schematic of the emitter driving assembly shown in Figures 7A and 7B utilizing resistive elements.

Figure 10 is a front view of an implementation of the omnidirectional emitter array of the sound image system for small venues showing a plurality of emitters forming an array and with the high and mid frequency emitters divided into three bands

Figure 11 is an illustration of the relationship of an omnidirectional emitter array to the audience area and how the acoustic energy is apportioned. It illustrates the nonuniform sound amplitude emitted by each of two spaced-apart emitters with the sound amplitude as a function of angle represented by the distance of the arcs from the respective emitters.

Figure 12 is an electrical schematic appropriate to the emitter array of Figure 9.

Figure 13A is a side elevational schematic of a second implementation of the emitter array of Figure 1.

Figure 13B is a front elevational schematic of the second implementation of the emitter array of Figure 13A.

Figure 14 is a schematic of a first electrical implementation of the emitter array shown in Figures 13A and 13B.

Figure 15 is a section view of a horn radiator producing a non uniform radiation.

Figure 16 is an exemplary schematic nonuniform sound amplitude emitted by the sound image system utilizing a uniform emitter in cooperation with a nonuniform emitter.

DETAILED DESCRIPTION OF THE INVENTION

It is desirable to improve the stereo image integrity at sound receiver, listener, locations not equidistant from the emitters representing stereo components without diminishing stereo performance at locations that are equidistant from the emitters. It is also desirable to improve the listener enjoyment when sound reinforcement is used in live performance. Stereo image distortion frequently occurs in sound reproduction resulting from path length differences at various listening locations. The following embodiments reveal methods and implementations to achieve these goals. The embodiments correct for these losses by providing a method of locating the various listener locations by associating listener location with a unique angle of radiation from the emitter and then providing means to alter the emitter performance as a function of angle to provide a corrected amplitude at the listener. This may be achieved in a sound reproduction system provided signals representing industry standard stereo components.

Sound reproduction and reinforcement systems and methods are presented herein for spatially enhancing stereo images typically used such performances as those involving music. The embodiments seek to expand the amount of audience area that would receive a sound image that maintains sound reproduction fidelity regarding spatial orientation of sound sources involved in an original performance. To expand the audience area receiving spatially faithful sound reproduction certain characteristics of sound have been first studied to find important factors involved.

Frequency, phase and amplitude can all play a part in the ability to accurately determine the location of a sound source. It is generally accepted that

wave frequency defines tonality and must be faithfully reproduced. It is also recognized that when all sound energy comes from a single emitter, the listener will be able to accurately locate the sound source regardless of listener position. Here the path length difference to each ear of the listener and thus the loudness sensed by each ear is dependant upon the orientation of the listener's head to the sound source.

In another case of multiple emitters where each emitter reproduces sound representing a different sound source relatively positioned at the location of the emitter, the reproduction is still faithful regardless of listener position. It is when one attempts to create the illusion of a sound source that is relatively positioned in a location other than a location of an emitter that image problems generally occur. An ideal case for conventional approaches is when listeners are equidistant from two or more emitters so that they receive correct amplitude information in the well known stereo effect. For conventional approaches, it is when a listener is not equidistant from the emitters and therefore have path length differences, that sound level anomalies occur.

Implementations of the sound image system uses emitter assemblies each having a collection of emitters arranged to produce a non-uniform sound amplitude radiation pattern which are collectively used together to reduce these anomalies. Other implementations use a mixture of emitter assemblies with at least one having a non-uniform radiation pattern. The non-uniform patterns of the emitter assemblies of the sound image system are fashioned so that for any location in an audience listening area, each emitter assembly located in a second area furnishes sound amplitudes at the location that are approximately equal to the sound amplitudes furnished by the other emitter assemblies of the sound image system for the location. To accomplish this requires a nonuniform amplitude distribution pattern from at least one of the emitters assemblies based upon the relative distances of the listener from the emitters.

In the implementation shown in Figure 1 these anomalies are compensated using emitter arrays, EA's 16-20 in cooperation with an Emitter Driving System, EDS 12 . Optimally this should be done while maintaining a substantially

uniform frequency response, at least over the range of frequencies in which the listener is reliant for location information.

In this system the EDS 12, shown in Figure 2, includes a sound source 30, such as a compact disk player providing an electrical signals representative of a stereo audio signal. A multi channel amplifier 32 to provide the requisite energy to power the emitter arrays 16-20 and an Emitter Energy Apportioner, EEA 34. The EEA 34 may be a part of the amplifier, a functionality of the emitter array ,EA, or as an element located anywhere within the EA or EDS 12, to distribute the energy within the EA's 16-20.

The EA's 16-20 are placed in a second area before an audience area 22, as shown in Figure 1. EA "A" 16 is depicted as the left most array. EA "B" 20 is depicted as the right most EA with dimension r 70 being the distance between. EA's which may be located between are designated item 18. The central axis 28 is defined as all points equidistant from the left and right EA's and bisecting the audience area forming an imaginary axis line. The central axis 28 is described as imaginary in the sense that it is not typically visible but is used herein for descriptive purposes such as to describe placement of the EA's and other such arrangements. Since the sound anomalies are dependant upon the EA to listener distance the audience area 22 may be further divided into zones 1-n 26. Zone 1 is designated as the near field zone and is bounded by the near field compensation border 23.This represents the boundary at which maximum correction is defined. At the other extreme are the most distant listener locations and are referred to as the far field zone N 26. This zone is limited by the far field compensation border 24 and is the distance limit from the EA's at which the anomalies are substantially compensated. Between these two zones are located any further compensation zones 26.

The anomalies in each audience area are compensated by causing the EA to direct more or less acoustic energy to that location. As the listener position moves further from the central axis 28, the compensation will increase. As the off axis listener position varies from the near field boundary 22 to the far field boundary 24, the compensation will decrease.

Figure 3 is a general presentation of how the emitter array elements can be related to multiple zones and listener positions within a zone. The listener area 22 shown in figure 1may be divided into a number of zones depending upon the size of the listening area. As depicted in Figure 1, zone 1 is the listener area closest to the emitter arrays and the emitters providing primary sound energy within this band are designated B1 Z1 - Bn Z1. Bands 1-N provide the varying sound energy as determined by the EEA 34 for off axis listener positions within the zone. Emitter groups designated Zone 2- N similarly provide primary sound energy to additional audience Zones 46

An implementation, as shown in Figure 4, includes the following steps. Install at least two emitter arrays, left and right 62. To provide more than one compensation zone these will be located above or below the audience plane. Supply a stage reference input to the EDS 64. This input should simulate a sound source located between the emitter arrays. Select a zone and symmetrically adjust the drive energy to the band emitters via the EEA 34 for an off axis location 66. If this is done ratio metrically, all locations within the zone will be corrected. Repeat the process for each set of emitters serving each zone. By making the EEA ratio metric, that is, what ever energy reduction is made toward one side of the central axis, a proportional increase will be made to the other side of the central axis 28. Additionally the left EA "A" 16 will be the complementary mirror image of the right EA "B" 20 as shown in Figure 5. When these relationships are followed system adjustment may be reduced to only one adjustment per zone.

The most sensitive indicator of correct compensation is when a sound source e.g. a solo instrument or singer, is equidistant between the EA's and the selected audience location is near the left or right extreme. At this location a listener may direct the system adjustment so that the soloist image appears equidistant between the EA's. Alternatively acoustic measurements may be made of each EA to ensure equal sound levels at the selected listener position.

The polar graph in Figure 5 represents such resultant nonuniform radiation patterns 74 from a pair of EA's. These patterns are tailored to alter the radiated sound energy as a function of direction in a fashion opposite to that

introduced by the geometry distortion and are shown as matching in amplitude but complementary in direction for the two EA's, "A" 16 and "B" 20. Figure 5 graphically shows the non uniform distribution from the implementation shown in Figure 1.

The necessary correction in emitter amplitude from two EA's, "A" 16 and "B" 20 are evaluated as follows. We let A 16 and B 20 represent locations of EA's that are electrically driven as a stereo pair and C 76 represent an arbitrary listening position, as shown in Figure 5. Further, we let r 70 represent the distance between A and B, s 80 the distance between B and C, t 78 the distance between A and C, and q 86 the angle between lines AB and BC. Then,

$$t^2 = r^2 + s^2 - 2rs \cos q$$

Given that sound amplitude decreases with the square of the distance from an emitter, then at C the sound from EA "A" 16 decreases by 1/s2 and the sound from EA "B" 20 decreases by 1/t2 . To accurately recreate sound images along line r, the EA at "A" must have an amplitude different from that of the AE at "B" by a factor, f, of (t2/s2), or

$$f = (r/s)^2 + 2(r/s) \cos q.$$

The sound amplitude radiated by each EA (Ac) 82,84, in acoustic units (db), as a function of angle will be: Ac= 10 log $((r/s)^2 + 2(r/s) \cos q.)$ The method described herein provides the necessary sound dispersion corrections without compromising the fidelity of the reproduction devices utilized in its implementation.

To provide proper amplitude corrections over a large audience area, EA's "A" and "B" are displaced from the audience plane, as defined as the locus of all listener positions within the audience area 22, as shown in Figure 6, so that, as the listener distance varies, so will the emitter angle to the listener, angle "D" 88 and correspondingly the loudness correction. It will be recognized that as the audience depth , C1 to Cn, increases so will angle "D" 88 and the required variation in correction will also change. In small venues such as a home, EA's "A" 16 and "B" 20 may be co located in the listener plane while still offering amplitude corrections as the listener position varies left and right of the central axis.

The front view of a typical implementation is shown in Figure 7b and the side view is shown in Figure 7a. To create the desired non uniform radiation pattern

from this array, some emitters 42a must radiate more energy than others 42b. In this implementation the emitters 42 are divided horizontally to serve three " zones" 26 . One set of emitters are vertically oriented toward the far field zone , "zone N", . A second set "1" is vertically oriented toward the closest listener area, Zone 1, the near field zone. The remaining emitters comprise a third set that is oriented toward an intermediate listener area as shown in Figure 6. These sets are orthogonally subdivided into three bands. Band "A" represents all emitters 42a oriented toward the listener area requiring increased radiation and band "B" 42b represents all the emitters oriented toward the listener area requiring decreased radiation. Band "C" 42c represents all the emitters that require no alteration of their radiation. The EEA in this implementation as depicted in Figure 8 provides the means for adjusting the distribution of drive energy between Bands A 42a & B 42b and therefor the desired non uniform radiation is shown in Figure 5. The EEA 34 using electrical elements to apportion the electrical energy is preferable to use of dissimilar emitters since it allows adjustment for listening environment and allows all emitters 42 to be identical. In this implementation a frequency selective apportioner 92 diverts the low frequency energy to low frequency emitter 50 and also diverts the mid and high frequency energy to the EEA's 34 and thence to the EA emitters 42 that form Zone 1. This energy is similarly diverted to each of the other EEA's the serve Zones 2 -N. The EEA for each zone may be used to adjust the compensation as a function of horizontal angle 2 86 to compensate anomalies at varying listener positions within the zone 26.

One implementation of an EEA contains a resistive network used to apportion energy from one set of emitters to an other set of emitters. A simple implementation of such a network incorporated as an EEA is designated as item 34 in Figure 9. In this implementation a variable resistive element 94 placed in shunt with an emitter set to be diminished in amplitude 42a causes less energy to be received at the shunted emitters. As the variable resistive element 94 is reduced in resistance the other series emitters 42b will receive more energy. Thus by varying the value of the variable resistive element 94 the energy apportionment may be

varied. An additional resistive element 96 may be placed in series with the variable resistive element 94 to limit the extent to which the energy may be unequal

An implementation for small listening venues, illustrated in Figure 10, incorporates a plurality of emitters to form an array that can approximate the response of an acoustical four pi steradian point source. Such an array lends itself to an implementation as it radiates in all directions with a uniform frequency response and through the incorporation of an adjustable EEA can produce the nonuniform radiation patterns as shown in Figure 11. In this implementation vertically facing low frequency emitter 50 in an appropriate enclosure 52 to control the out of phase emissions operates in cooperation with an ellipsoidal reflector 110 to reproduce the low frequency portion of the spectrum with omni directional radiation. The mid and high frequencies are reproduced by a plurality of emitters 42 situated on that ellipsoid to form an array. If all emitters receive equal drive energy, the sound energy will be equal in all directions as depicted as a circle 72 in Figure 11. To create the desired non uniform radiation pattern 74 from this array, some emitters must receive more energy than others. In this implementation the emitters 42 have been divided into three" bands" . Band "C" 42c is vertically oriented orthogonally to the inter array axis (A-B). Band "A" represents the emitters 42a oriented toward the listener area requiring increased radiation and band "B" 42b represents the emitters oriented toward the listener area requiring decreased radiation. In this implementation the EEA for adjusting the distribution of drive energy and therefor the desired non uniform radiation may be similar to the one shown in Figure 12. Using electrical elements to redistribute the electrical energy is preferable to use of dissimilar emitters since it allows adjustment for listening environment and allows all emitters 42 to be identical. . In this arrangement a frequency selective apportioner 92 diverts the low frequency energy to low frequency emitter 50 and also diverts the mid and high frequency energy to the EEA 34 and thence to the emitters. The emitters in the array are divided into three bands. The central emitter band "C" 42c, which are not amplitude altered and two variable bands of emitters "A"42a and "B" 42b. The redistribution of sound energy is depicted as an ellipse 74 in Figure 11. This implementation offers no compensation as a function of room depth but compensates only on a single curve

before and a matching curve behind the speakers. The extent that a further listener is not on those curves or on the central axis 28, the amplitude will be unequal though it will be an improvement over systems without amplitude compensation. This configuration does not incorporate separate zones related to listener distance. Since vertical distribution angle is not a consideration the emitters may be co located in the listener plane and may be appropriate for many small listening environments such as a home. In the distance relationship given above, if s 80 and t 78 are chosen to be much greater than the inter speaker distance, r 70, it is seen that the errors occurring on such large arcs will suffer only a slight degradation and that for most purposes they can be ignored.

As a further implementation the radiant energy can also be restricted vertically in a more conventional radiation pattern where the majority of the sound energy is directed toward the audience. Figure 13 depicts a representative implementation achieving the desired nonuniform amplitude pattern. Figure 13 b shows this implementation in a frontal view and Figure 13a shows a side view. In this implementation two low frequency emitters 50 are oriented toward the listening area. Three emitters 42 to reproduce the mid and high frequencies are oriented with one intended to be toward the listening area and the other two oriented; one to the left and one to the right. Utilizing an EEA more energy is distributed to one of the angled emitters 42a and less to the other angled emitter 42b. This creates the non uniform energy distribution desired in this implementation and is shown in Figure 5. The overall system of this implementation is shown in Figure 14. In this implementation the EEA 34 causes one emitter 42a to receive less drive energy and emitter 42b will receive more. Additionally the low frequency emitters 50a and 50b may be adjusted to redistribute the sound energy as a function of angle by incorporating an additional EEA as shown in Figure 14.

As an additional implementation a refractor horn 120 as shown in Figure 15 may be utilized in place of the afore utilized arrays. In this implementation the essentially uniform radiation of an emitter 126 is intercepted by a refractor horn with non uniform dimensions and redirects the acoustic energy to the listening areas with a nonuniform intensity. The EEA in this implementation is a property of the

asymmetrical construction of the refractor horn. The nonuniform energy apportionment is determined by appropriate selection of the horn entrance 122 and exit areas 124 . As depicted in Figure 15 the horn exit areas 124 are equal and the entrance angles and areas 122 are varied as a function of angle and illustrates only one of many possible combinations that, to those skilled in the art, would be known to achieve the same result. As depicted entrance D 122d is the smallest and will therefor direct the least acoustic energy to its corresponding exit 124d. Entrance A 122a is the largest entrance and will therefor direct the largest amount of acoustic energy to its corresponding exit 124a. Entrances B122b and C 122c are proportioned to the areas of A and D. Thus, the desired directivity may be achieved by purely mechanoacoustic means, without associated electronic components or signal processing. The horn designer selects the apportionment and the EEA is a property of its design. A typical installation would consist of two or more horn emitters installed as complementary pairs.

An implementation can consist of only one nonuniform emitter as shown in Figure 16. In this configuration one emitter array, selected for purposes of demonstration as emitter array "B", generates a non uniform radiation to compensate for emitter to listener distances. Emitter "A" has a uniform radiation pattern, emanating substantially uniform energy toward the audience area. This implementation while demonstrating that all the compensation can be provided by only one nonuniform emitter array also demonstrates that there exist a continuum of divisions which can correct the spatial anomalies. This implementation does however suffer from a variation in overall sound intensity when a listener position is changed. When the listener moves from left to right he will experience a decrease in overall sound intensity. As the anomaly correction becomes more evenly distributed between the emitter arrays, the intensity variation tends to diminish.

From the foregoing it will be appreciated that, although specific implementations have been described herein for the purposes of illustration, various modifications may be made without deviating from the spirit and scope of the invention. Accordingly, the invention is not limited except as by the appended claims.

CLAIMS

The invention claimed is

1. A sound reproduction system comprising at least two sound sources, at least one of said at least two sound sources emitting an acoustical sound wave with a nonuniform amplitude distribution pattern, the sound sources together producing an area remote from the respective sound sources including points non-equidistant from the at least two sound sources where amplitudes received from the at least two sound sources are approximately equal at points within the area.

2. A sound reinforcement or reproduction system of claim 1 wherein the sound sources are displaced from the plane of the listening positions.

3. The sound production system of claim 1 wherein at least one sound source further comprises a plurality of sound sources radiating acoustical waves in nonparallel directions and in unequal amplitudes.

4. A sound reinforcement or reproduction system of claim 3 wherein the sound sources are displaced from the plane of the listening positions.

5. The sound production system of claim 1 wherein the amplitude of a first acoustical wave emitted from a first sound source in a first direction is a multiple of the amplitude of a second acoustical wave emitted from a second sound source in a second direction intersecting the first acoustical wave within said remote area at a point of intersection, the multiple being a function of the relative distances of said first and second sound sources from said intersection.

6. A sound reinforcement or reproduction system of claim 5 wherein the sound sources are displaced from the plane of the listening positions.

7. A sound reproduction system comprising at least two sound sources and a mask between the sound source and said area toward which the sound source is directed, the mask having an nonuniform absorption capability yielding an

acoustical wave emerging therefrom having a nonuniform amplitude distribution, the sound sources and the mask together producing an area remote from the respective sound sources including points non-equidistant from the at least two sound sources where amplitudes received from the at least two sound sources are approximately equal at points within the area.

8. A sound reinforcement or reproduction system of claim 7 wherein the sound sources are displaced from the plane of the listening positions.

9. The sound reproduction system of claim 5 wherein distance, t, between the point of intersection within the remote area and the first sound source is a function of distance, s, between the point of intersection within the remote area and the second sound source.

10. A sound reinforcement or reproduction system of claim 9 wherein the sound sources are displaced from the plane of the listening positions.

11. The sound reproduction system of claim 9 wherein said function is in accordance with the following relationship $t^2 = r^2 + s^2 - 2rs \cos q$ where : r represents the distance between sound sources at A and B, s the distance between B and C, a listener location, t the distance between A and C, and q the angle between lines AB and BC.

12. A sound reinforcement or reproduction system of claim 11 wherein the sound sources are displaced from the plane of the listening positions.

13. A sound reproduction system producing a sound image at a plurality of listening locations within an area remote apparently emanating from a point equidistant between the sound sources, the system comprising at least two sound sources including a plurality of directional sound sources, arranged such that amplitudes of sound waves from the respective sound sources at points within the remote areas are approximately equal.

14. A sound reinforcement or reproduction system of claim 13 wherein the sound sources are displaced from the plane of the listening positions.

15. The sound reproduction system of claim 13 comprising two sound sources respectively representing left and right stereo sound signals with directionally nonuniform wave amplitude distribution patterns wherein each of the two sound sources comprises a plurality of acoustical wave loud speakers.

16. A sound reinforcement or reproduction system of claim 15 wherein the sound sources are displaced from the plane of the listening positions.

17. In a sound reproduction system including a plurality of sound sources, the method of obtaining remote areas non-equidistant from the sound sources where acoustical wave amplitudes received from said plurality of sound sources are approximately equal, comprising the following steps:

a. Positioning said plurality of sound sources before the remote areas;

b. Adjusting the acoustical wave amplitudes emanating from the sound sources as a function of direction to create an amplitude distribution pattern varying with direction of emission yields approximately equal amplitudes received within said remote areas.

18. The method of claim 17 wherein the additional step of positioning said sound sources out of the plane of the listening areas is added.

19. The method of claim 17 wherein the radiation from each source varies substantially in accordance with the formula $t^2 = r^2 + s^2 - 2rs \cos q$ where :

r represents the distance between sound sources at A and B,
s the distance between B and C, a listener location,
t the distance between A and C, and
q the angle between lines AB and BC.

20. The method of claim 19 wherein the additional step of positioning said sound sources out of the plane of the listening areas is added.

21. A system for an audience area, the audience area having a near field compensation border, the audience area being adjacent a second area along the near field compensation border, the second area having a first reference location the system comprising:

a plurality of sound emitters configured to be placed in a first configuration in the second area; and

an emitter energy apportioner configured to be coupled to the plurality of sound emitters to send signals to the sound emitters having energy distributed amongst the signals such that the sound emitters being in the first configuration in the second area collectively emit a first sound pattern, the first sound pattern configured to be received having a first sound energy amplitude for at least a first sound frequency by a sound receiver at a first location in the audience area a first distance from the near field compensation border and a second distance from the first reference location with the sound receiver facing the first reference location in the second area, the first sound pattern configured to be received having a second sound energy amplitude for at least the first sound frequency by the sound receiver at a second location in the audience area a third distance from the near field compensation border and a fourth distance from the first reference location with the sound receiver facing the first reference location in the second area, the first distance approximating the third second distance, the second distance being different from the fourth distance, and the first sound energy amplitude approximating the second sound energy amplitude.

22. A system for an audience area, the audience area having a near field compensation border, the audience area containing a sound receiver having a left channel sound receiver and a right channel sound receiver, the audience area being adjacent a second area along the near field compensation border, the second area having a first reference location the system comprising:

a plurality of sound emitters configured to be placed in a first configuration in the second area; and

an emitter energy apportioner configured to be coupled to the plurality of sound emitters to send signals to the sound emitters having energy

distributed amongst the signals such that the sound emitters being in the first configuration in the second area collectively emit a first sound pattern, the first sound pattern configured to be received having a first audible sound information content with a first left channel frequency-amplitude distribution to be received by the left channel receiver of the sound receiver and a first right channel frequency-amplitude distribution to be received by the right channel receiver of the sound receiver at a first location in the audience area a first distance from the near field compensation border and a second distance from the first reference location with the sound receiver facing the first reference location in the second area, the first sound pattern configured to be received having a second audible sound information content with a second left channel frequency-amplitude distribution to be received by the left channel receiver of the sound receiver and a second right channel frequency-amplitude distribution to be received by the right channel receiver of the sound receiver by the sound receiver at a second location in the audience area a third distance from the near field compensation border and a fourth distance from the first reference location with the sound receiver facing the first reference location in the second area, the first distance approximating the third distance, the second distance being different from the fourth distance, and the differences between the first left channel frequency-amplitude distribution and the first right channel frequency-amplitude distribution approximating the differences between the second left channel frequency-amplitude distribution and the second right channel frequency-amplitude distribution.

23. The system of claim 22 wherein the sound receiver is a human and the left channel sound receiver is the human's left ear and the right channel sound receiver is the human's right ear, and wherein the first audible sound information content and the second audible sound information content are of one of a solo performer.

24. A system for an audience area, the audience area having a near field compensation border and a far field compensation border, the audience area having first and second portions on approximately either side of an imaginary axis line running from the near field compensation border to the far field compensation border,

the audience area being adjacent a second area along the near field compensation border, the axis line extending into the second area, the system comprising:

a first emitter array having a first plurality of sound emitters located in the second area on a first side of the axis line, at least one of the first plurality of sound emitters positioned as an inwardly directed first emitter to emit sound toward the audience area and toward the axis line, at least one of the first plurality of sound emitters positioned as an outwardly directed first emitter to emit sound toward the audience area and away from the axis line; a second emitter array having a second plurality of sound emitters located in the second area on a second side of the axis line, at least one of the second plurality of sound emitters positioned as an inwardly directed second emitter to emit sound toward the audience area and toward the axis line, at least one of the second plurality of sound emitters positioned as an outwardly directed second emitter to emit sound toward the audience area and away from the axis line; and

an emitter energy apportioner configured to be coupled to the first plurality of sound emitters and the second plurality of sound emitters to send a first signal having a first information content to the first plurality of sound emitters in an apportioned manner so that the first signal received by the inwardly directed first emitter has a larger magnitude than the first signal received by the outwardly directed first emitter and to send a second signal having a second information content to the second plurality of sound emitters in an apportioned manner so that the second signal received by the inwardly directed second emitter has a larger magnitude than the first signal received by the outwardly directed second emitter.

25. A system for an audience area, the audience area having a near field compensation border and a far field compensation border, the audience area having first and second portions on approximately either side of an imaginary axis line running from the near field compensation border to the far field compensation border, the audience area being adjacent a second area along the near field compensation border, the axis line extending into the second area, the system comprising:

a first emitter array having a first plurality of sound emitters located in the second area on a first side of the axis line, a first of the first plurality of sound

emitters positioned to direct a center of a sound wave at a first angle with respect to the axis line and a second of the first plurality of sound emitters to direct a center of a sound wave sound at a second angle with respect to the axis line; a second emitter array having a second plurality of sound emitters located in the second area on a second side of the axis line, a first of the second plurality of sound emitters positioned to direct a center of a sound wave at a third angle with respect to the axis line and a second of the second plurality of sound emitters to direct a center of a sound wave sound at a fourth angle with respect to the axis line; and

an emitter energy apportioner configured to be coupled to the first plurality of sound emitters and the second plurality of sound emitters to send a first signal having a first information content to the first plurality of sound emitters in an apportioned manner so that the first signal received by the first of the first plurality of sound emitters has a different degree of magnitude than the first signal received by the second of the first plurality of sound emitters and to send a second signal having a second information content to the second plurality of sound emitters in an apportioned manner so that the second signal received by the first of the second plurality of sound emitters has a different degree of magnitude than the second signal received by the second of the second plurality of sound emitters so that at a number of locations in the audience area equidistant from the near field compensation border and at different distances from the axis line the amplitude of sound received from the first emitter array is approximately constant and the amplitude of sound received from the second emitter array is approximately constant.

26. A system for an audience area, the audience area having a near field compensation border and a far field compensation border, the audience area having first and second portions on approximately either side of an imaginary axis line running from the near field compensation border to the far field compensation border, the audience area being adjacent a second area along the near field compensation border, the axis line extending into the second area, the system comprising:

a first emitter array having a first plurality of sound emitters located in the second area on a first side of the axis line, at least one of the first plurality of sound emitters positioned as an inwardly directed first emitter to emit sound toward the

audience area and toward the axis line, at least one of the first plurality of sound emitters positioned as an outwardly directed first emitter to emit sound toward the audience area and away from the axis line; a second emitter array having a second plurality of sound emitters located in the second area on a second side of the axis line, at least one of the second plurality of sound emitters positioned as an inwardly directed second emitter to emit sound toward the audience area and toward the axis line, at least one of the second plurality of sound emitters positioned as an outwardly directed second emitter to emit sound toward the audience area and away from the axis line; and

an emitter energy apportioner configured to be coupled to the first plurality of sound emitters and the second plurality of sound emitters to send a first signal having a first information content to the first plurality of sound emitters and to send a second signal having a second information content to the second plurality of sound emitters in an apportioned manner so that as the amplitude of the first signal received by the inwardly directed first emitter is increased in amplitude a first degree, the amplitude of the first signal received by the outwardly directed first emitter is decreased in amplitude by the first degree and the second signal received by the inwardly directed second emitter is increased by the first degree and the second signal received by the outwardly directed second emitter is decreased by the first degree.

27. A system for an audience area, the audience area having a near field compensation border and a far field compensation border, the audience area having first and second portions on approximately either side of an imaginary axis line running from the near field compensation border to the far field compensation border, the audience area being adjacent a second area along the near field compensation border, the axis line extending into the second area, the system comprising:

a first emitter array having a first plurality of sound emitters located in the second area on a first side of the axis line, at least one of the first plurality of sound emitters positioned as an inwardly directed first emitter to emit sound toward the audience area and toward the axis line, at least one of the first plurality of sound emitters positioned as an outwardly directed first emitter to emit sound toward the audience area and away from the axis line; a second emitter array having a second

plurality of sound emitters located in the second area on a second side of the axis line, at least one of the second plurality of sound emitters positioned as an inwardly directed second emitter to emit sound toward the audience area and toward the axis line, at least one of the second plurality of sound emitters positioned as an outwardly directed second emitter to emit sound toward the audience area and away from the axis line; and

an emitter energy apportioner configured to be coupled to the first plurality of sound emitters and the second plurality of sound emitters to send a first signal having a first information content to the first plurality of sound emitters and to send a second signal having a second information content to the second plurality of sound emitters in an apportioned manner so that as the amplitude of the sound emitted by the inwardly directed first emitter is increased in the amplitude a first degree, the amplitude of the sound emitted by the outwardly directed first emitter is decreased in amplitude by the first degree, the sound emitted by the inwardly directed second emitter is increased by the first degree and the sound emitted by the outwardly directed second emitter is decreased by the first degree.

28. A system for an audience area, the audience area having a near field compensation border and a far field compensation border, the audience area having first and second portions on approximately either side of an imaginary axis line running from the near field compensation border to the far field compensation border, the audience area being adjacent a second area along the near field compensation border, the axis line extending into the second area, the system comprising:

a first emitter array having a first plurality of sound emitters located in the second area on a first side of the axis line, the first plurality having a plurality of rows of sound emitters, the emitters for each row being angled differently relative to a horizontal reference, each of the rows of emitters being associated with a different section of the audience area having a different minimum distance and a different maximum distance from the near field compensation border, for each row, at least one of the first plurality of sound emitters positioned as an inwardly directed first emitter to emit sound toward the audience area and toward the axis line, for each row, at least one of the first plurality of sound emitters positioned as an outwardly directed first

emitter to emit sound toward the audience area and away from the axis line; a second emitter array having a second plurality of sound emitters located in the second area on a second side of the axis line, the second plurality having a plurality of rows of sound emitters, the emitters for each row being angled differently relative to a horizontal reference, each of the rows of emitters being associated with a different section of the audience area having a different minimum distance and a different maximum distance from the near field compensation border, for each row, at least one of the second plurality of sound emitters positioned as an inwardly directed second emitter to emit sound toward the audience area and toward the axis line, for each row, at least one of the second plurality of sound emitters positioned as an outwardly directed second emitter to emit sound toward the audience area and away from the axis line; and

an emitter energy apportioner configured to be coupled to the first plurality of sound emitters and the second plurality of sound emitters to send a first signal having a first information content to the first plurality of sound emitters in an apportioned manner so that the first signal received by the inwardly directed first emitter of each row has a larger magnitude than the first signal received by the outwardly directed first emitter of each row, the difference in magnitudes between signals being received by the inwardly directed first emitter and outwardly directly first emitter of each row being smaller as the row is associated with sections of the audience area with larger minimum and maximum distances from the near field border, and to send a second signal having a second information content to the second plurality of sound emitters in an apportioned manner so that the second signal received by the inwardly directed second emitter of each row has a larger magnitude than the first signal received by the outwardly directed second emitter of each row, the difference in magnitudes between signals being received by the inwardly directed second emitter and outwardly directly second emitter of each row being smaller as the row is associated with sections of the audience area with larger minimum and maximum distances from the near field border.

29. A system for an audience area, the audience area having a near field compensation border and a far field compensation border, the audience area having first and second portions on approximately either side of an imaginary axis line

running from the near field compensation border to the far field compensation border, the audience area being adjacent a second area along the near field compensation border, the axis line extending into the second area, the system comprising:

a first emitter array having a first plurality of sound emitters located in the second area on a first side of the axis line, the first plurality having a plurality of rows of sound emitters, the emitters for each row being angled differently relative to a horizontal reference, each of the rows of emitters being associated with a different section of the audience area having a different minimum distance and a different maximum distance from the near field compensation border, for each row, at least one of the first plurality of sound emitters positioned as an inwardly directed first emitter to emit sound toward the audience area and toward the axis line, for each row at least one of the first plurality of sound emitters positioned as an outwardly directed first emitter to emit sound toward the audience area and away from the axis line; a second emitter array having a second plurality of sound emitters located in the second area on a second side of the axis line, the second plurality having a plurality of rows of sound emitters, the emitters for each row being angled differently relative to a horizontal reference, each of the rows of emitters being associated with a different section of the audience area having a different minimum distance and a different maximum distance from the near field compensation border, for each row, at least one of the second plurality of sound emitters positioned as an inwardly directed second emitter to emit sound toward the audience area and toward the axis line, for each row, at least one of the second plurality of sound emitters positioned as an outwardly directed second emitter to emit sound toward the audience area and away from the axis line; and

an emitter energy apportioner configured to be coupled to the first plurality of sound emitters and the second plurality of sound emitters to send a first signal having a first information content to the first plurality of sound emitters and to send a second signal having a second information content to the second plurality of sound emitters in an apportioned manner so that as the amplitude of the sound emitted by the inwardly directed first emitter of each row is increased in the amplitude a first relative degree, the amplitude of the sound emitted by the outwardly directed first emitter of each row is decreased in amplitude by the first relative degree, the sound

emitted by the inwardly directed second emitter of each row is increased by the first relative degree and the sound emitted by the outwardly directed second emitter of each row is decreased by the first relative degree,

30. A system for an audience area, the audience area having a near field compensation border and a far field compensation border, the audience area having first and second portions on approximately either side of an imaginary axis line running from the near field compensation border to the far field compensation border, the audience area being adjacent a second area along the near field compensation border, the axis line extending into the second area, the system comprising:

a first emitter array having a first plurality of sound emitters located in the second area on a first side of the axis line, a first of the first plurality of sound emitters positioned to direct a center of a sound wave at a first angle with respect to the axis line and a second of the first plurality of sound emitters positioned to direct a center of a sound wave sound at a second angle with respect to the axis line; a second emitter array having a second plurality of sound emitters located in the second area on a second side of the axis line, a first of the second plurality of sound emitters positioned to direct a center of a sound wave at a third angle with respect to the axis line and a second of the second plurality of sound emitters positioned to direct a center of a sound wave sound at a fourth angle with respect to the axis line; and

an emitter energy apportioner configured to be coupled to the first plurality of sound emitters and the second plurality of sound emitters to send a first signal having a first information content to the first plurality of sound emitters in an apportioned manner so that the first signal received by the first of the first plurality of sound emitters has a different degree of magnitude than the first signal received by the second of the first plurality of sound emitters and to send a second signal having a second information content to the second plurality of sound emitters in an uniform manner so that the second signal received by the first of the second plurality of sound emitters approximates the degree of magnitude of the second signal received by the second of the second plurality of sound emitters so that at a first location in the audience area a first distant from the near field compensation border and at second distance from the axis line, for a range of audible sound frequencies, the relative

difference between the amplitude of sound received from the first emitter array and the amplitude of sound received from the second emitter array approximates the relative difference between the amplitude of sound received from the first emitter array and the amplitude of sound received from the second emitter array at a second location in the audience area being the first distance from the near field compensation border and being a distance from the axis line other than the second distance.

31. A system for an audience area, the audience area having a near field compensation border and a far field compensation border, the audience area having first and second portions on approximately either side of an imaginary axis line running from the near field compensation border to the far field compensation border, the audience area being adjacent a second area along the near field compensation border, the axis line extending into the second area, the system comprising:

a first emitter array having a first plurality of sound emitters located in the second area on a first side of the axis line, a first of the first plurality of sound emitters positioned to direct a center of a sound wave at a first angle with respect to the axis line and a second of the first plurality of sound emitters positioned to direct a center of a sound wave sound at a second angle with respect to the axis line; a second emitter array having a second plurality of sound emitters located in the second area on a second side of the axis line, a first of the second plurality of sound emitters positioned to direct a center of a sound wave at a third angle with respect to the axis line and a second of the second plurality of sound emitters positioned to direct a center of a sound wave sound at a fourth angle with respect to the axis line; and

an emitter energy apportioner configured to be coupled to the first plurality of sound emitters and the second plurality of sound emitters to send a first signal having a first information content to the first plurality of sound emitters in an apportioned manner so that the first signal received by the first of the first plurality of sound emitters has a different degree of magnitude than the first signal received by the second of the first plurality of sound emitters and to send a second signal having a second information content to the second plurality of sound emitters in an apportioned manner so that the second signal received by the first of the second plurality of sound emitters has a different degree of magnitude than the second signal received by the

second of the second plurality of sound emitters so that at a first location in the audience area a first distant from the near field compensation border and at second distance from the axis line, for a range of audible sound frequencies, the relative difference between the amplitude of sound received from the first emitter array and the amplitude of sound received from the second emitter array approximates the relative difference between the amplitude of sound received from the first emitter array and the amplitude of sound received from the second emitter array at a second location in the audience area being the first distance from the near field compensation border and being a distance from the axis line other than the second distance.

32. A method for an audience area, the audience area having a near field compensation border, the audience area being adjacent a second area along the near field compensation border, the second area having a first reference location, the method comprising:

placing a plurality of sound emitters in a first configuration in the second area; and

sending signals to the sound emitters having energy distributed amongst the signals such that the sound emitters being in the first configuration in the second area collectively emit a first sound pattern, the first sound pattern configured to be received having a first sound energy amplitude for at least a first sound frequency by a sound receiver at a first location in the audience area a first distance from the near field compensation border and a second distance from the first reference location with the sound receiver facing the first reference location in the second area, the first sound pattern configured to be received having a second sound energy amplitude for at least the first sound frequency by the sound receiver at a second location in the audience area a third distance from the near field compensation border and a fourth distance from the first reference location with the sound receiver facing the first reference location in the second area, the first distance approximating the third second distance, the second distance being different from the fourth distance, and the first sound energy amplitude approximating the second sound energy amplitude.

33. A method for an audience area, the audience area having a near field compensation border, the audience area containing a sound receiver having a left channel sound receiver and a right channel sound receiver, the audience area being adjacent a second area along the near field compensation border, the second area having a first reference location the method comprising:

placing a plurality of sound emitters configured in a first configuration in the second area; and

sending signals to the plurality of sound emitters having energy distributed amongst the signals such that the sound emitters being in the first configuration in the second area collectively emit a first sound pattern, the first sound pattern configured to be received having a first audible sound information content with a first left channel frequency-amplitude distribution to be received by the left channel receiver of the sound receiver and a first right channel frequency-amplitude distribution to be received by the right channel receiver of the sound receiver at a first location in the audience area a first distance from the near field compensation border and a second distance from the first reference location with the sound receiver facing the first reference location in the second area, the first sound pattern configured to be received having a second audible sound information content with a second left channel frequency-amplitude distribution to be received by the left channel receiver of the sound receiver and a second right channel frequency-amplitude distribution to be received by the right channel receiver of the sound receiver by the sound receiver at a second location in the audience area a third distance from the near field compensation border and a fourth distance from the first reference location with the sound receiver facing the first reference location in the second area, the first distance approximating the third distance, the second distance being different from the fourth distance, and the differences between the first left channel frequency-amplitude distribution and the first right channel frequency-amplitude distribution approximating the differences between the second left channel frequency-amplitude distribution and the second right channel frequency-amplitude distribution.

34. A method for an audience area, the audience area having a near field compensation border and a far field compensation border, the audience area

having first and second portions on approximately either side of an imaginary axis line running from the near field compensation border to the far field compensation border, the audience area being adjacent a second area along the near field compensation border, the axis line extending into the second area, the method comprising:

having a first plurality of sound emitters in the second area on a first side of the axis line, at least one of the first plurality of sound emitters positioned as an inwardly directed first emitter to emit sound toward the audience area and toward the axis line, at least one of the first plurality of sound emitters positioned as an outwardly directed first emitter to emit sound toward the audience area and away from the axis line;

having a second plurality of sound emitters in the second area on a second side of the axis line, at least one of the second plurality of sound emitters positioned as an inwardly directed second emitter to emit sound toward the audience area and toward the axis line, at least one of the second plurality of sound emitters positioned as an outwardly directed second emitter to emit sound toward the audience area and away from the axis line;

sending a first signal having a first information content to the first plurality of sound emitters in an apportioned manner so that the first signal received by the inwardly directed first emitter has a larger magnitude than the first signal received by the outwardly directed first emitter; and

sending a second signal having a second information content to the second plurality of sound emitters in an apportioned manner so that the second signal received by the inwardly directed second emitter has a larger magnitude than the first signal received by the outwardly directed second emitter.

35. A method for an audience area, the audience area having a near field compensation border and a far field compensation border, the audience area having first and second portions on approximately either side of an imaginary axis line running from the near field compensation border to the far field compensation border, the audience area being adjacent a second area along the near field compensation border, the axis line extending into the second area, the method comprising:

having a first plurality of sound emitters in the second area on a first side of the axis line, a first of the first plurality of sound emitters positioned to direct a center of a sound wave at a first angle with respect to the axis line and a second of the first plurality of sound emitters to direct a center of a sound wave sound at a second angle with respect to the axis line;

having a second plurality of sound emitters in the second area on a second side of the axis line, a first of the second plurality of sound emitters positioned to direct a center of a sound wave at a third angle with respect to the axis line and a second of the second plurality of sound emitters to direct a center of a sound wave sound at a fourth angle with respect to the axis line;

sending a first signal having a first information content to the first plurality of sound emitters in an apportioned manner so that the first signal received by the first of the first plurality of sound emitters has a different degree of magnitude than the first signal received by the second of the first plurality of sound emitters; and

sending a second signal having a second information content to the second plurality of sound emitters in an apportioned manner so that the second signal received by the first of the second plurality of sound emitters has a different degree of magnitude than the second signal received by the second of the second plurality of sound emitters so that at a number of locations in the audience area equidistant from the near field compensation border and at different distances from the axis line the amplitude of sound received from the first emitter array is approximately constant and the amplitude of sound received from the second emitter array is approximately constant.

36. A method for an audience area, the audience area having a near field compensation border and a far field compensation border, the audience area having first and second portions on approximately either side of an imaginary axis line running from the near field compensation border to the far field compensation border, the audience area being adjacent a second area along the near field compensation border, the axis line extending into the second area, the method comprising:

having a first plurality of sound emitters in the second area on a first side of the axis line, at least one of the first plurality of sound emitters positioned as an

inwardly directed first emitter to emit sound toward the audience area and toward the axis line, at least one of the first plurality of sound emitters positioned as an outwardly directed first emitter to emit sound toward the audience area and away from the axis line;

having a second plurality of sound emitters in the second area on a second side of the axis line, at least one of the second plurality of sound emitters positioned as an inwardly directed second emitter to emit sound toward the audience area and toward the axis line, at least one of the second plurality of sound emitters positioned as an outwardly directed second emitter to emit sound toward the audience area and away from the axis line; and

sending a first signal having a first information content to the first plurality of sound emitters and a second signal having a second information content to the second plurality of sound emitters in an apportioned manner so that as the amplitude of the first signal received by the inwardly directed first emitter is increased in amplitude a first degree, the amplitude of the first signal received by the outwardly directed first emitter is decreased in amplitude by the first degree and the second signal received by the inwardly directed second emitter is increased by the first degree and the second signal received by the outwardly directed second emitter is decreased by the first degree.

37. A method for an audience area, the audience area having a near field compensation border and a far field compensation border, the audience area having first and second portions on approximately either side of an imaginary axis line running from the near field compensation border to the far field compensation border, the audience area being adjacent a second area along the near field compensation border, the axis line extending into the second area, the method comprising:

having a first plurality of sound emitters in the second area on a first side of the axis line, at least one of the first plurality of sound emitters positioned as an inwardly directed first emitter to emit sound toward the audience area and toward the axis line, at least one of the first plurality of sound emitters positioned as an outwardly directed first emitter to emit sound toward the audience area and away from the axis line;

having a second plurality of sound emitters in the second area on a second side of the axis line, at least one of the second plurality of sound emitters positioned as an inwardly directed second emitter to emit sound toward the audience area and toward the axis line, at least one of the second plurality of sound emitters positioned as an outwardly directed second emitter to emit sound toward the audience area and away from the axis line; and

sending a first signal having a first information content to the first plurality of sound emitters and a second signal having a second information content to the second plurality of sound emitters in an apportioned manner so that as the amplitude of the sound emitted by the inwardly directed first emitter is increased in the amplitude a first degree, the amplitude of the sound emitted by the outwardly directed first emitter is decreased in amplitude by the first degree, the sound emitted by the inwardly directed second emitter is increased by the first degree and the sound emitted by the outwardly directed second emitter is decreased by the first degree.

38. A method for an audience area, the audience area having a near field compensation border and a far field compensation border, the audience area having first and second portions on approximately either side of an imaginary axis line running from the near field compensation border to the far field compensation border, the audience area being adjacent a second area along the near field compensation border, the axis line extending into the second area, the method comprising:

having a first plurality of sound emitters in the second area on a first side of the axis line, the first plurality having a plurality of rows of sound emitters, the emitters for each row being angled differently relative to a horizontal reference, each of the rows of emitters being associated with a different section of the audience area having a different minimum distance and a different maximum distance from the near field compensation border, for each row, at least one of the first plurality of sound emitters positioned as an inwardly directed first emitter to emit sound toward the audience area and toward the axis line, for each row, at least one of the first plurality of sound emitters positioned as an outwardly directed first emitter to emit sound toward the audience area and away from the axis line;

having a second plurality of sound emitters in the second area on a second side of the axis line, the second plurality having a plurality of rows of sound emitters, the emitters for each row being angled differently relative to a horizontal reference, each of the rows of emitters being associated with a different section of the audience area having a different minimum distance and a different maximum distance from the near field compensation border, for each row, at least one of the second plurality of sound emitters positioned as an inwardly directed second emitter to emit sound toward the audience area and toward the axis line, for each row, at least one of the second plurality of sound emitters positioned as an outwardly directed second emitter to emit sound toward the audience area and away from the axis line;

sending a first signal having a first information content to the first plurality of sound emitters in an apportioned manner so that the first signal received by the inwardly directed first emitter of each row has a larger magnitude than the first signal received by the outwardly directed first emitter of each row, the difference in magnitudes between signals being received by the inwardly directed first emitter and outwardly directly first emitter of each row being smaller as the row is associated with sections of the audience area with larger minimum and maximum distances from the near field border; and

sending a second signal having a second information content to the second plurality of sound emitters in an apportioned manner so that the second signal received by the inwardly directed second emitter of each row has a larger magnitude than the first signal received by the outwardly directed second emitter of each row, the difference in magnitudes between signals being received by the inwardly directed second emitter and outwardly directly second emitter of each row being smaller as the row is associated with sections of the audience area with larger minimum and maximum distances from the near field border.

39. A method for an audience area, the audience area having a near field compensation border and a far field compensation border, the audience area having first and second portions on approximately either side of an imaginary axis line running from the near field compensation border to the far field compensation border,

the audience area being adjacent a second area along the near field compensation border, the axis line extending into the second area, the method comprising:

having a first plurality of sound emitters in the second area on a first side of the axis line, the first plurality having a plurality of rows of sound emitters, the emitters for each row being angled differently relative to a horizontal reference, each of the rows of emitters being associated with a different section of the audience area having a different minimum distance and a different maximum distance from the near field compensation border, for each row, at least one of the first plurality of sound emitters positioned as an inwardly directed first emitter to emit sound toward the audience area and toward the axis line, for each row at least one of the first plurality of sound emitters positioned as an outwardly directed first emitter to emit sound toward the audience area and away from the axis line;

having a second plurality of sound emitters located in the second area on a second side of the axis line, the second plurality having a plurality of rows of sound emitters, the emitters for each row being angled differently relative to a horizontal reference, each of the rows of emitters being associated with a different section of the audience area having a different minimum distance and a different maximum distance from the near field compensation border, for each row, at least one of the second plurality of sound emitters positioned as an inwardly directed second emitter to emit sound toward the audience area and toward the axis line, for each row, at least one of the second plurality of sound emitters positioned as an outwardly directed second emitter to emit sound toward the audience area and away from the axis line; and

sending a first signal having a first information content to the first plurality of sound emitters and a second signal having a second information content to the second plurality of sound emitters in an apportioned manner so that as the amplitude of the sound emitted by the inwardly directed first emitter of each row is increased in the amplitude a first relative degree, the amplitude of the sound emitted by the outwardly directed first emitter of each row is decreased in amplitude by the first relative degree, the sound emitted by the inwardly directed second emitter of each row is increased by the first relative degree and the sound emitted by the outwardly directed second emitter of each row is decreased by the first relative degree,

40. A method for an audience area, the audience area having a near field compensation border and a far field compensation border, the audience area having first and second portions on approximately either side of an imaginary axis line running from the near field compensation border to the far field compensation border, the audience area being adjacent a second area along the near field compensation border, the axis line extending into the second area, the method comprising:

having a first plurality of sound emitters in the second area on a first side of the axis line, a first of the first plurality of sound emitters positioned to direct a center of a sound wave at a first angle with respect to the axis line and a second of the first plurality of sound emitters positioned to direct a center of a sound wave sound at a second angle with respect to the axis line;

having a second plurality of sound emitters in the second area on a second side of the axis line, a first of the second plurality of sound emitters positioned to direct a center of a sound wave at a third angle with respect to the axis line and a second of the second plurality of sound emitters positioned to direct a center of a sound wave sound at a fourth angle with respect to the axis line; and

sending a first signal having a first information content to the first plurality of sound emitters in an apportioned manner so that the first signal received by the first of the first plurality of sound emitters has a different degree of magnitude than the first signal received by the second of the first plurality of sound emitters and a second signal having a second information content to the second plurality of sound emitters in an uniform manner so that the second signal received by the first of the second plurality of sound emitters approximates the degree of magnitude of the second signal received by the second of the second plurality of sound emitters so that at a first location in the audience area a first distant from the near field compensation border and at second distance from the axis line, for a range of audible sound frequencies, the relative difference between the amplitude of sound received from the first emitter array and the amplitude of sound received from the second emitter array approximates the relative difference between the amplitude of sound received from the first emitter array and the amplitude of sound received from the second emitter array at a second location

in the audience area being the first distance from the near field compensation border and being a distance from the axis line other than the second distance.

41. A method for an audience area, the audience area having a near field compensation border and a far field compensation border, the audience area having first and second portions on approximately either side of an imaginary axis line running from the near field compensation border to the far field compensation border, the audience area being adjacent a second area along the near field compensation border, the axis line extending into the second area, the method comprising:

having a first plurality of sound emitters in the second area on a first side of the axis line, a first of the first plurality of sound emitters positioned to direct a center of a sound wave at a first angle with respect to the axis line and a second of the first plurality of sound emitters positioned to direct a center of a sound wave sound at a second angle with respect to the axis line;

having a second plurality of sound emitters in the second area on a second side of the axis line, a first of the second plurality of sound emitters positioned to direct a center of a sound wave at a third angle with respect to the axis line and a second of the second plurality of sound emitters positioned to direct a center of a sound wave sound at a fourth angle with respect to the axis line; and

sending a first signal having a first information content to the first plurality of sound emitters in an apportioned manner so that the first signal received by the first of the first plurality of sound emitters has a different degree of magnitude than the first signal received by the second of the first plurality of sound emitters and a second signal having a second information content to the second plurality of sound emitters in an apportioned manner so that the second signal received by the first of the second plurality of sound emitters has a different degree of magnitude than the second signal received by the second of the second plurality of sound emitters so that at a first location in the audience area a first distant from the near field compensation border and at second distance from the axis line, for a range of audible sound frequencies, the relative difference between the amplitude of sound received from the first emitter array and the amplitude of sound received from the second emitter array approximates the relative difference between the amplitude of sound received from the first emitter array

and the amplitude of sound received from the second emitter array at a second location in the audience area being the first distance from the near field compensation border and being a distance from the axis line other than the second distance.

ABSTRACT

Sound reproduction and reinforcement systems and methods are presented herein for spatially enhancing stereo images typically used such performances as those involving music. The embodiments seek to expand the amount of audience area that would receive a sound image that maintains sound reproduction fidelity regarding spatial orientation of sound sources involved in an original performance. To expand the audience area receiving spatially faithful sound reproduction certain characteristics of sound have been first studied to find important factors involved.

Title: METHOD AND APPARATUS FOR SPATIALLY ENHANCING THE STEREO IMAGE IN SOUND REPRODUCTION AND REINFORCEMENT SYSTEMS

Express Mail No.: EL852691820US Inventor: Baron C. Dickey Docket No. 60399-3

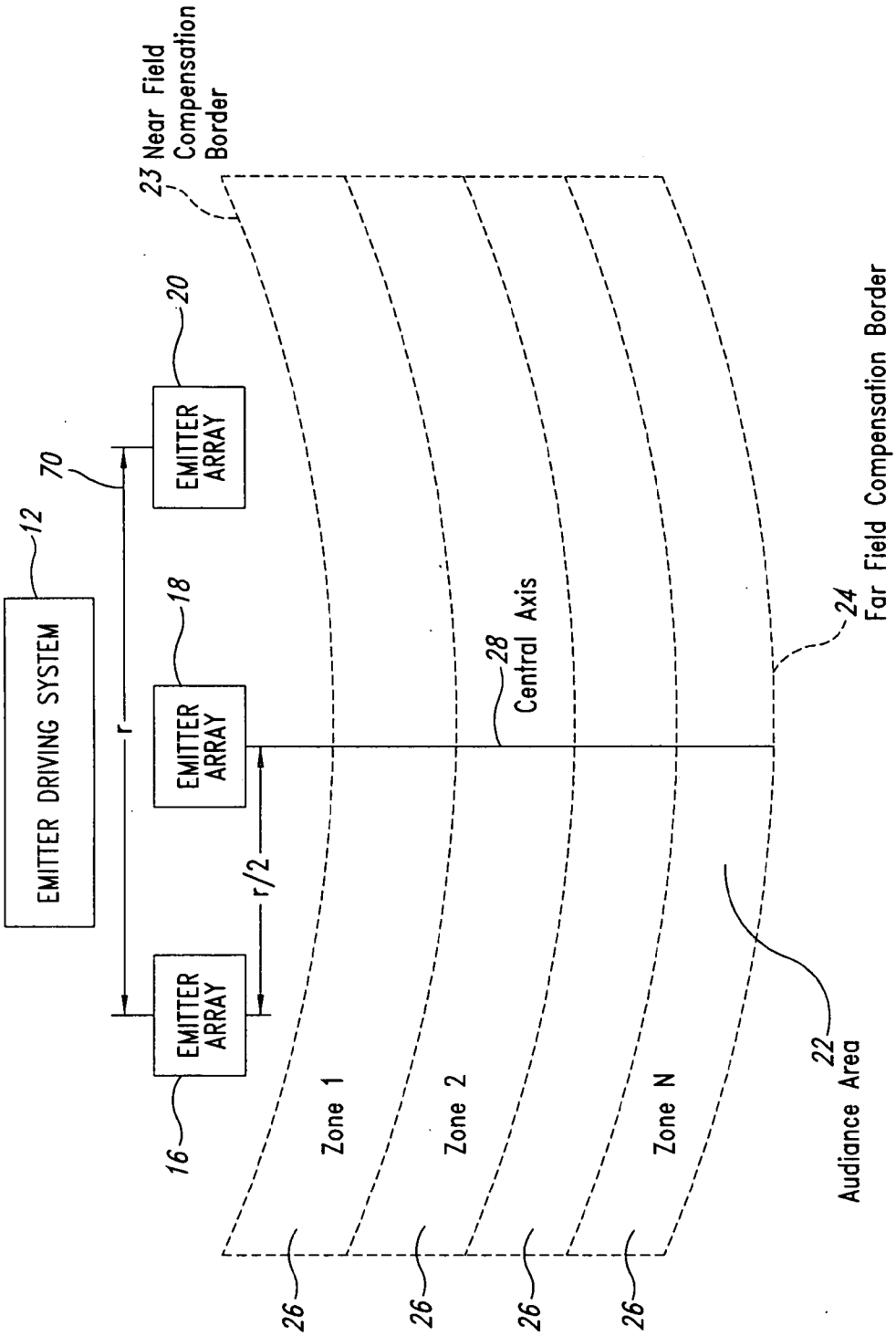

Fig. 1

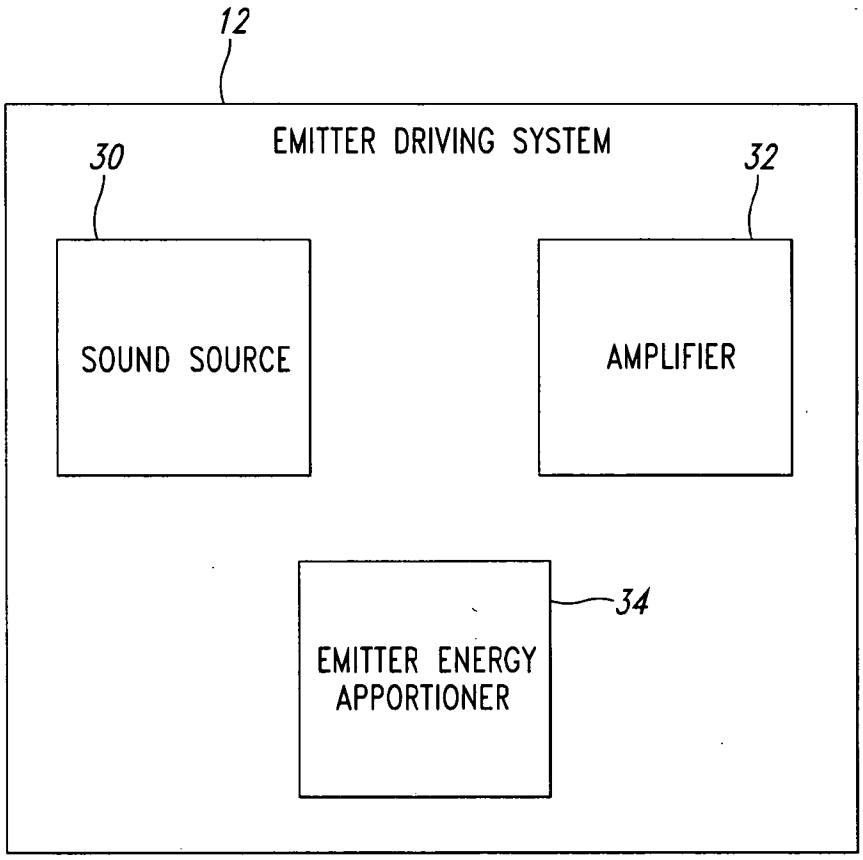
12
EMITTER DRIVING SYSTEM
30
32
SOUND SOURCE
AMPLIFIER
34
EMITTER ENERGY APPORTIONER

Fig. 2

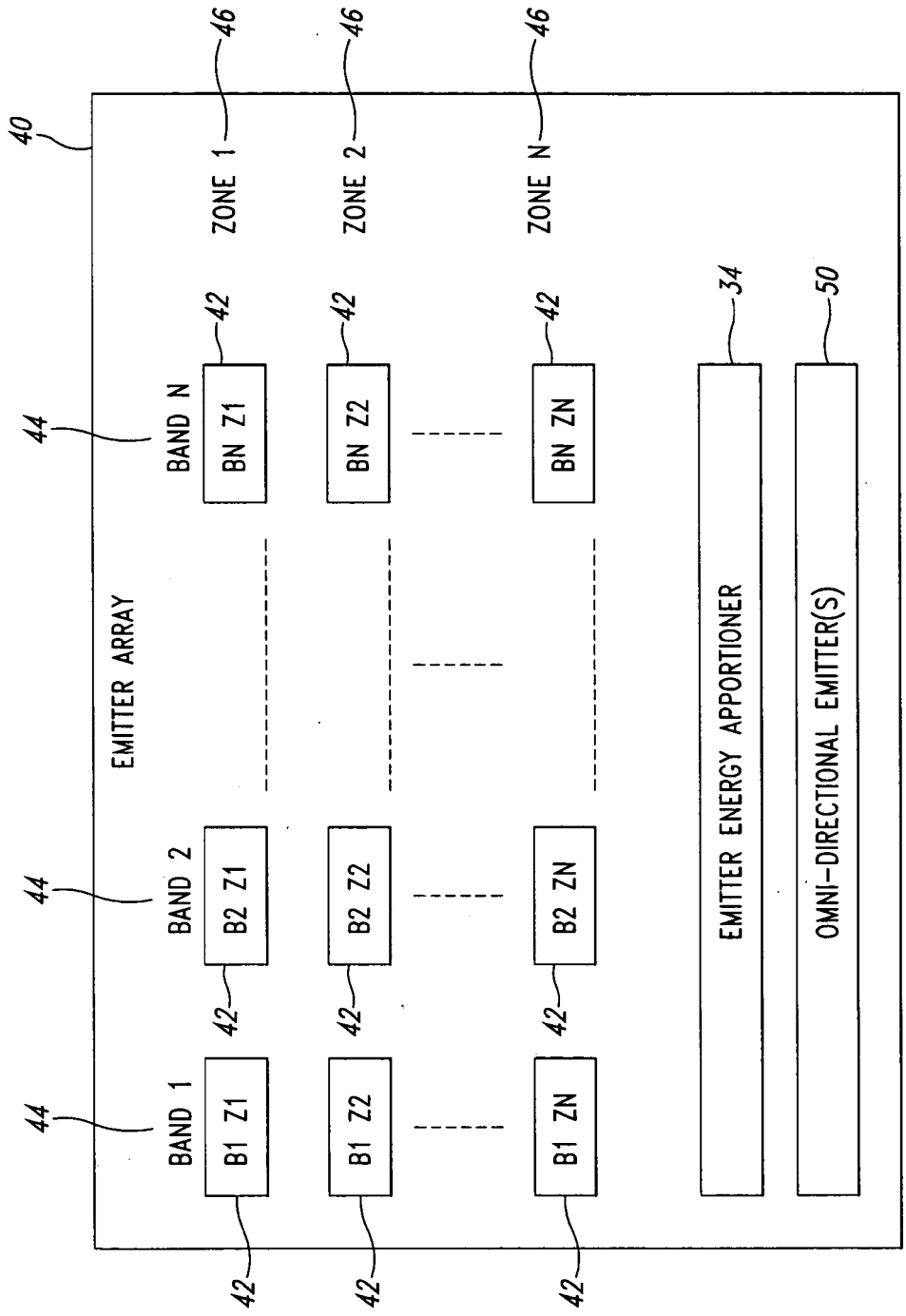
40
ZONE 1
ZONE 2
ZONE N
46
46
46
EMITTER ARRAY
BAND N
BAND 2
BAND 1
44
44
44
BN Z1
BN Z2
BN ZN
B2 Z1
B2 Z2
B2 ZN
B1 Z1
B1 Z2
B1 ZN
42
42
42
42
42
42
42
42
42
EMITTER ENERGY APPORTIONER
OMNI-DIRECTIONAL EMITTER(S)
34
50

Fig. 3

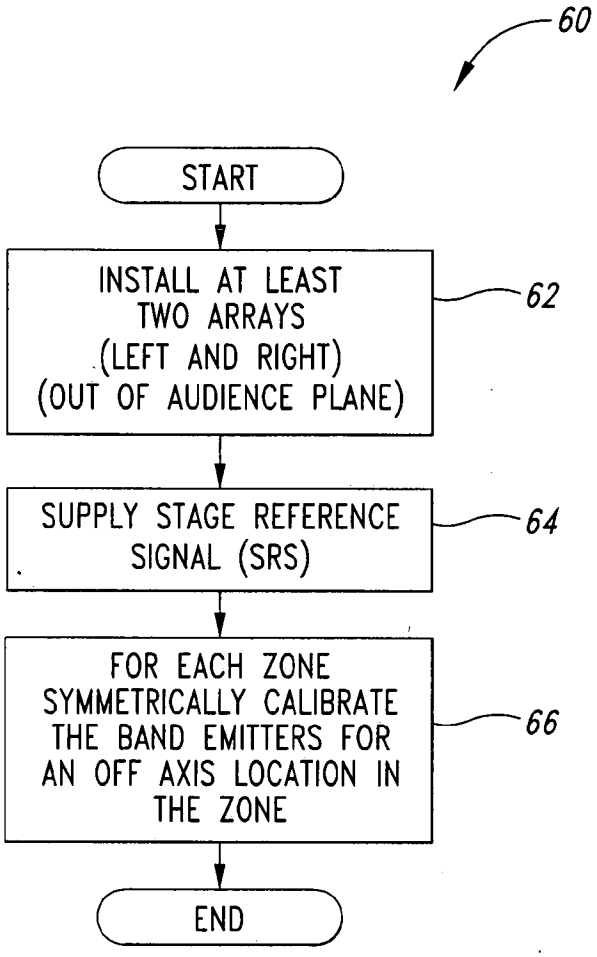
60
START
INSTALL AT LEAST TWO ARRAYS (LEFT AND RIGHT) (OUT OF AUDIENCE PLANE)
62
SUPPLY STAGE REFERENCE SIGNAL (SRS)
64
FOR EACH ZONE SYMMETRICALLY CALIBRATE THE BAND EMITTERS FOR AN OFF AXIS LOCATION IN THE ZONE
66
END

Fig. 4

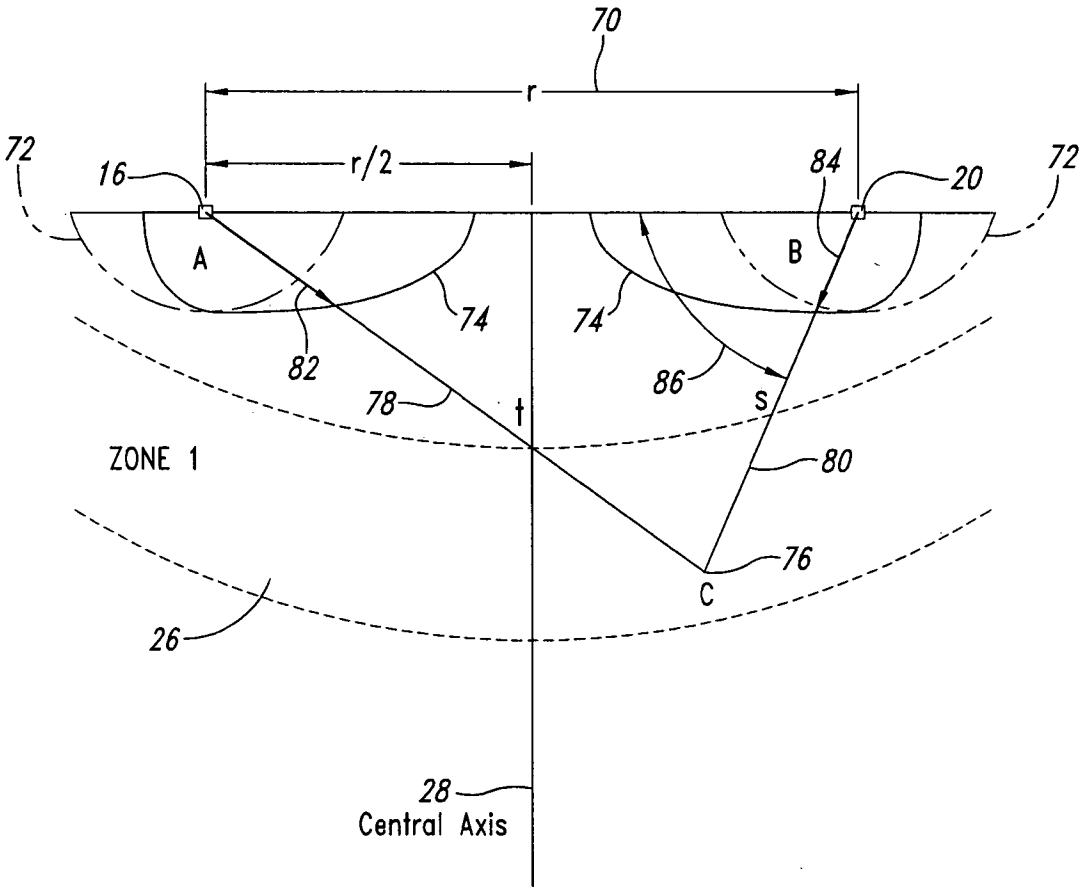
70
r
r/2
72
16
84
20
72
A
B
74
74
82
86
78
t
S
ZONE 1
80
76
C
26
28
Central Axis

Fig. 5

Title: METHOD AND APPARATUS FOR SPATIALLY ENHANCING THE STEREO IMAGE IN SOUND REPRODUCTION AND REINFORCEMENT SYSTEMS

Express Mail No.: EL852691820US Inventor: Baron C. Dickey Docket No. 60399-3

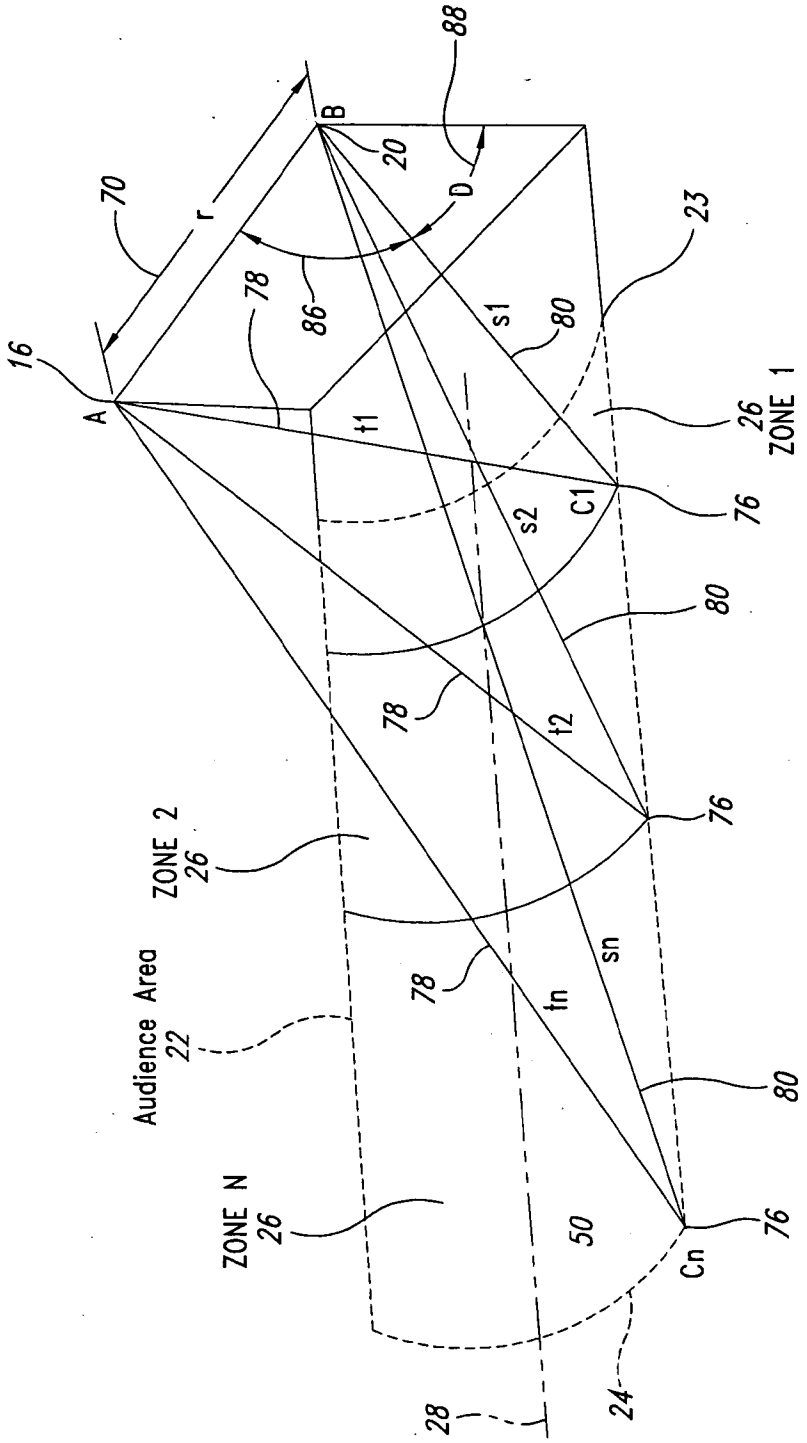

Fig. 6

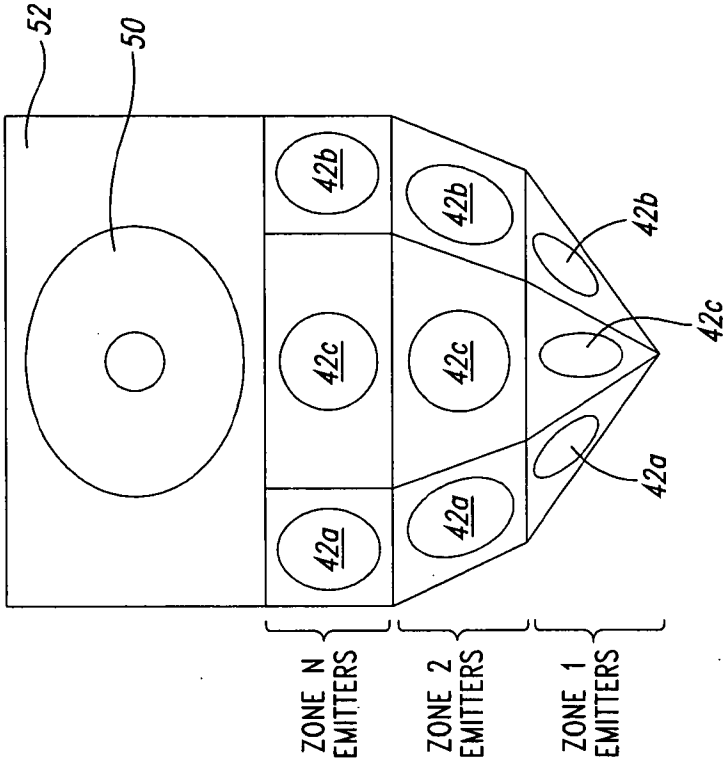
52
50
42b
42b
42b
42c
42c
42c
42a
42a
42a
ZONE N EMITTERS
ZONE 2 EMITTERS
ZONE 1 EMITTERS

Fig. 7B

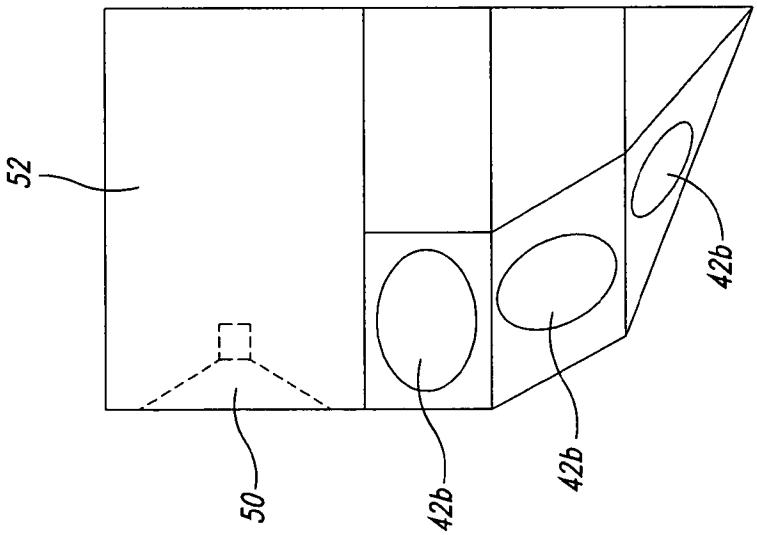
52
50
42b
42b
42b

Fig. 7A

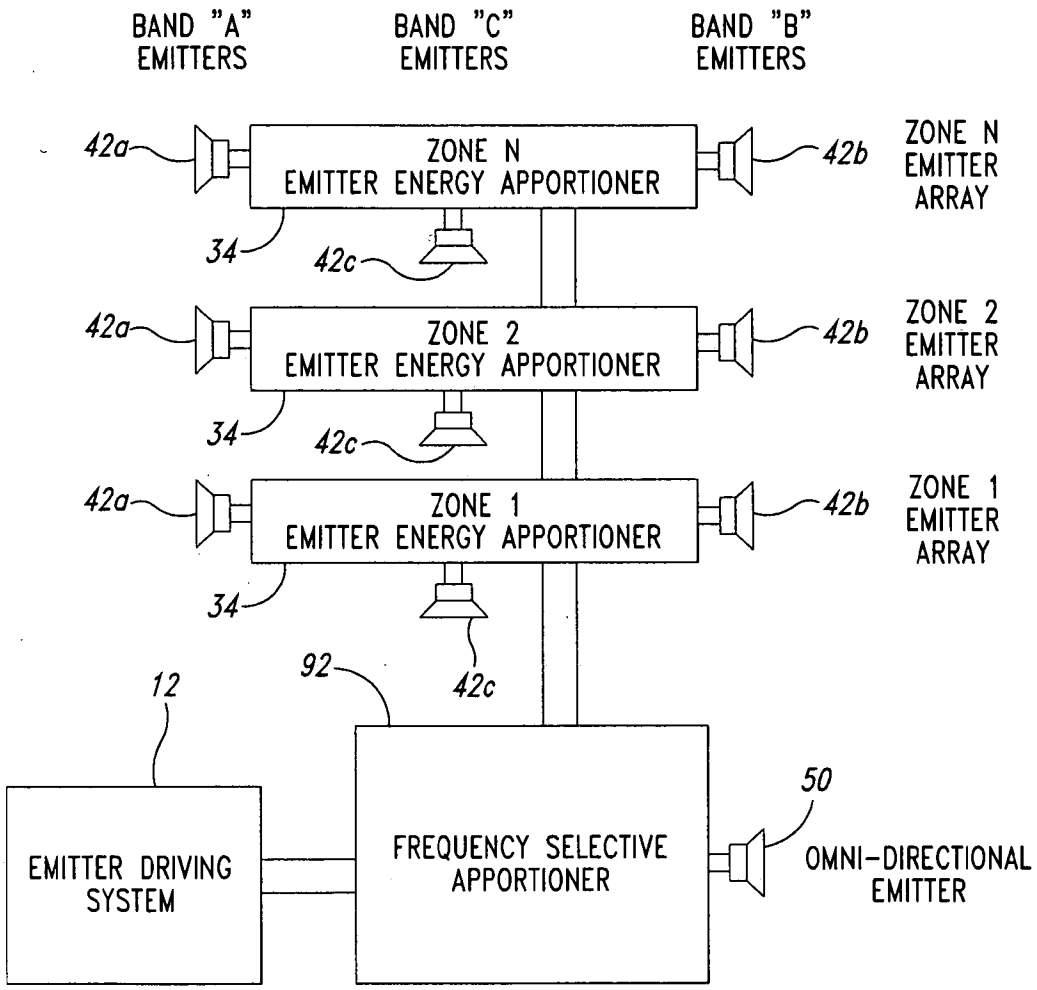
BAND "A" EMITTERS
BAND "C" EMITTERS
BAND "B" EMITTERS
42a
ZONE N EMITTER ENERGY APPORTIONER
42b
ZONE N EMITTER ARRAY
34
42c
42a
ZONE 2 EMITTER ENERGY APPORTIONER
42b
ZONE 2 EMITTER ARRAY
34
42c
42a
ZONE 1 EMITTER ENERGY APPORTIONER
42b
ZONE 1 EMITTER ARRAY
34
92
42c
12
50
EMITTER DRIVING SYSTEM
FREQUENCY SELECTIVE APPORTIONER
OMNI-DIRECTIONAL EMITTER

Fig. 8

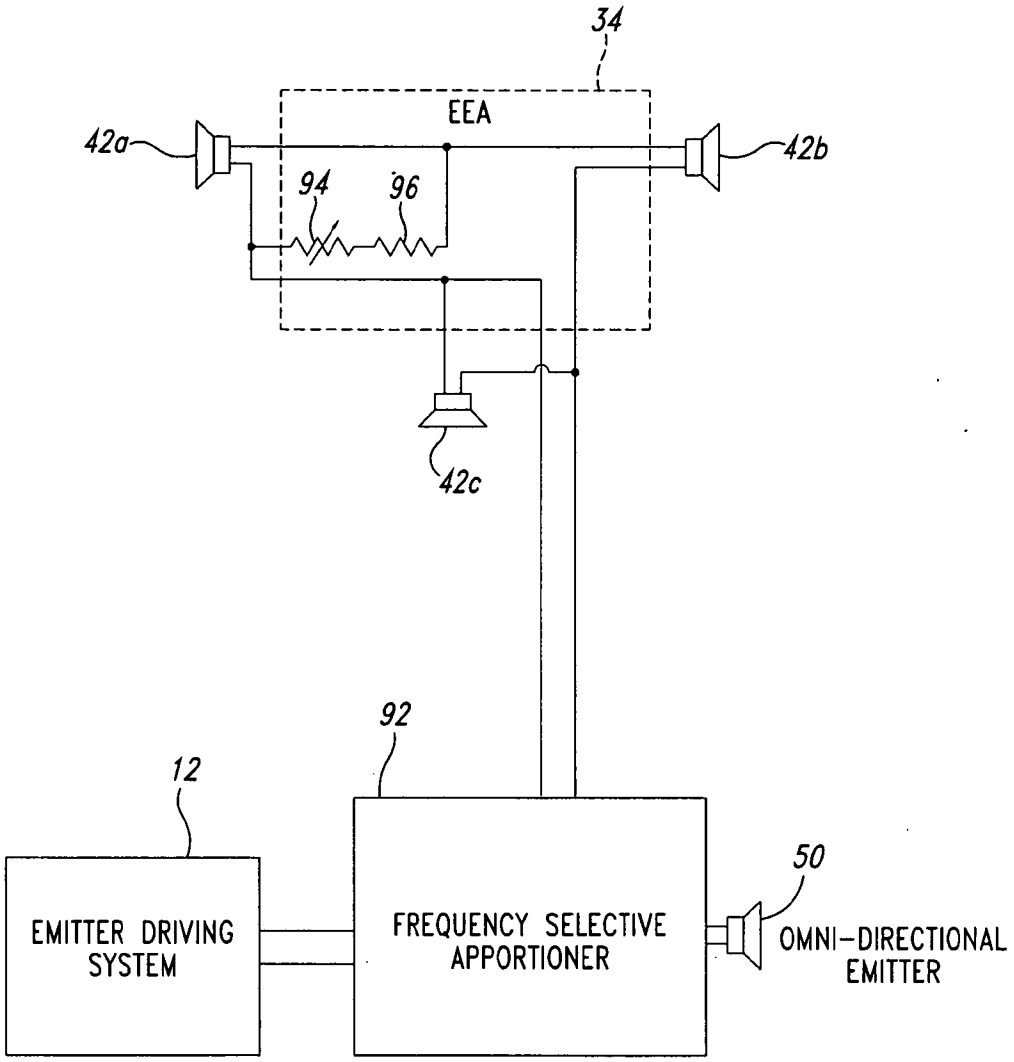
34
EEA
42a
42b
94
96
42c
92
12
50
EMITTER DRIVING SYSTEM
FREQUENCY SELECTIVE APPORTIONER
OMNI-DIRECTIONAL EMITTER

Fig. 9

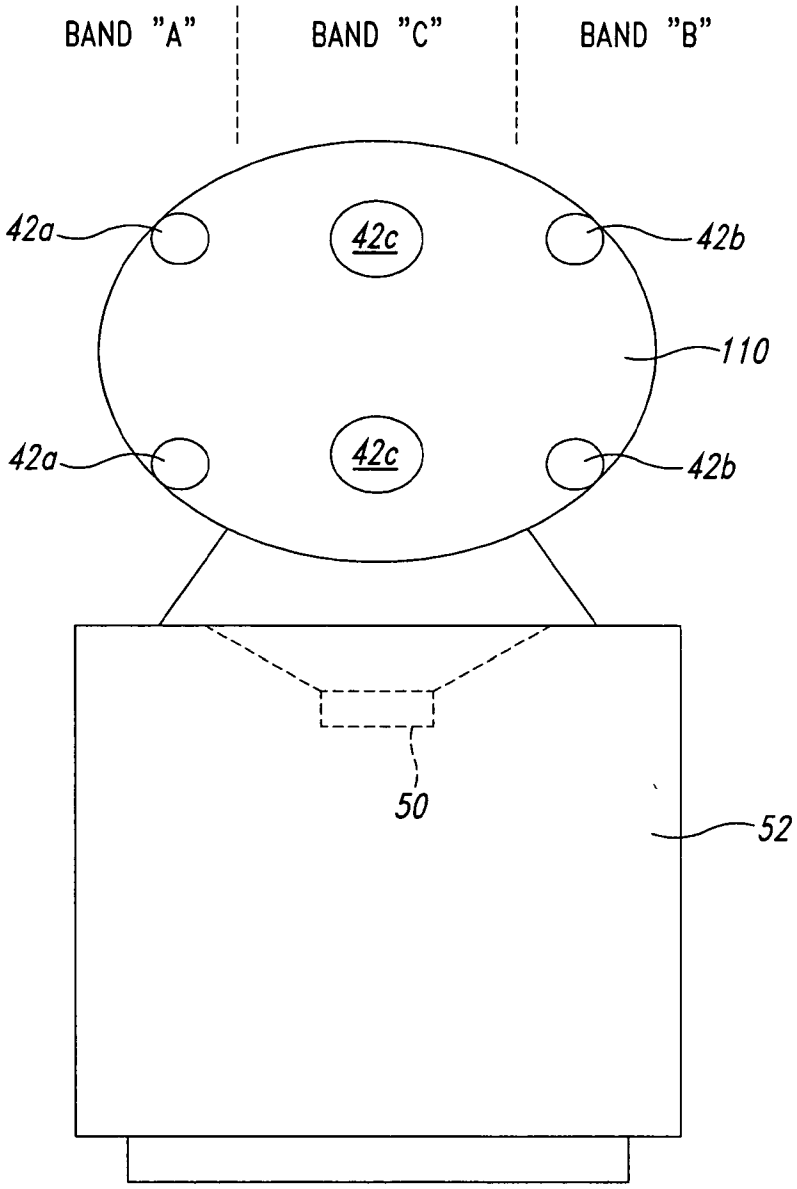

Fig. 10

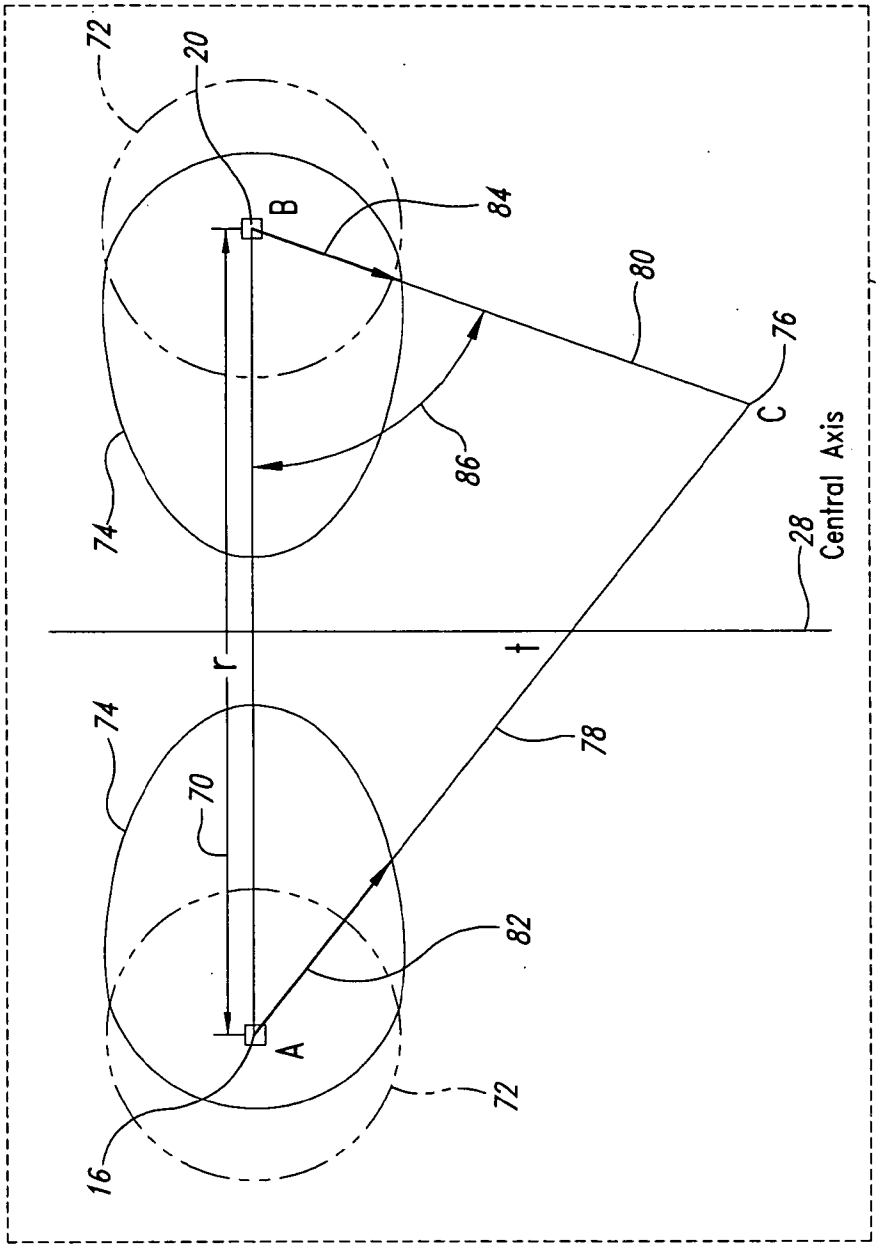
72
20
B
84
80
22
Audience Area
76
C
86
74
28
Central Axis
r
t
74
78
70
82
A
72
16

Fig. 11

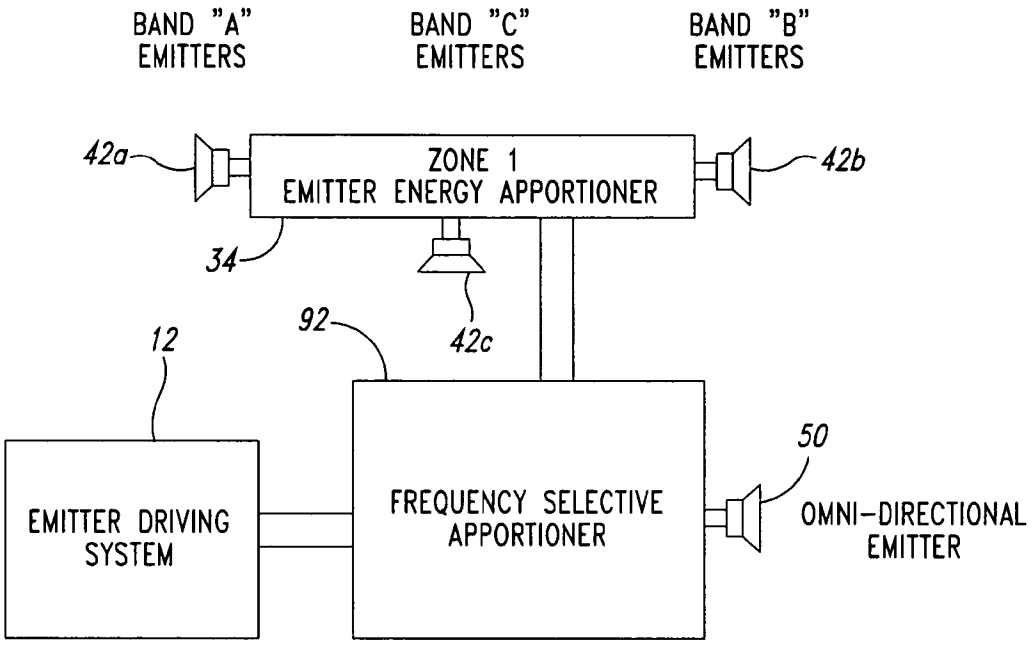
BAND "A" EMITTERS
BAND "C" EMITTERS
BAND "B" EMITTERS
42a
ZONE 1 EMITTER ENERGY APPORTIONER
42b
34
92
42c
12
50
EMITTER DRIVING SYSTEM
FREQUENCY SELECTIVE APPORTIONER
OMNI-DIRECTIONAL EMITTER

Fig. 12

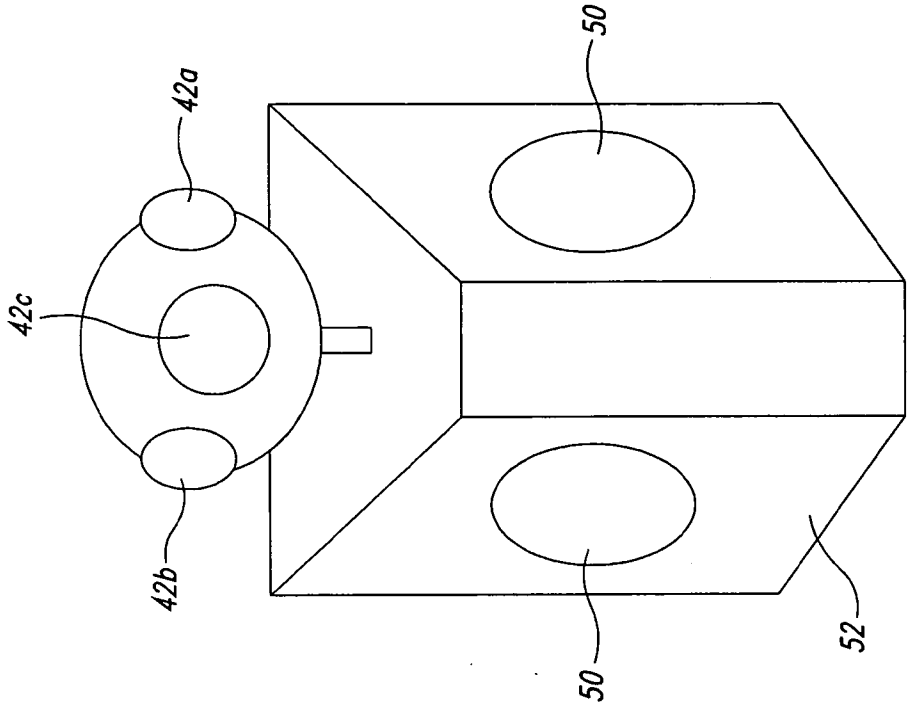

Fig. 13B

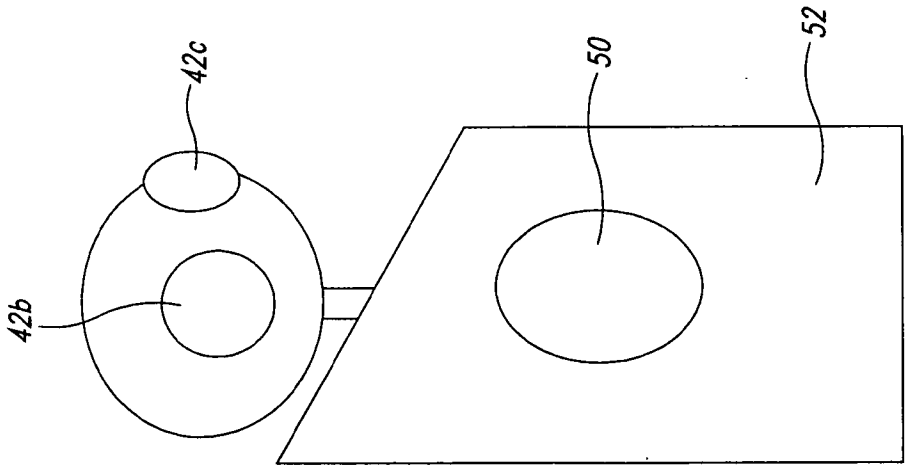

Fig. 13A

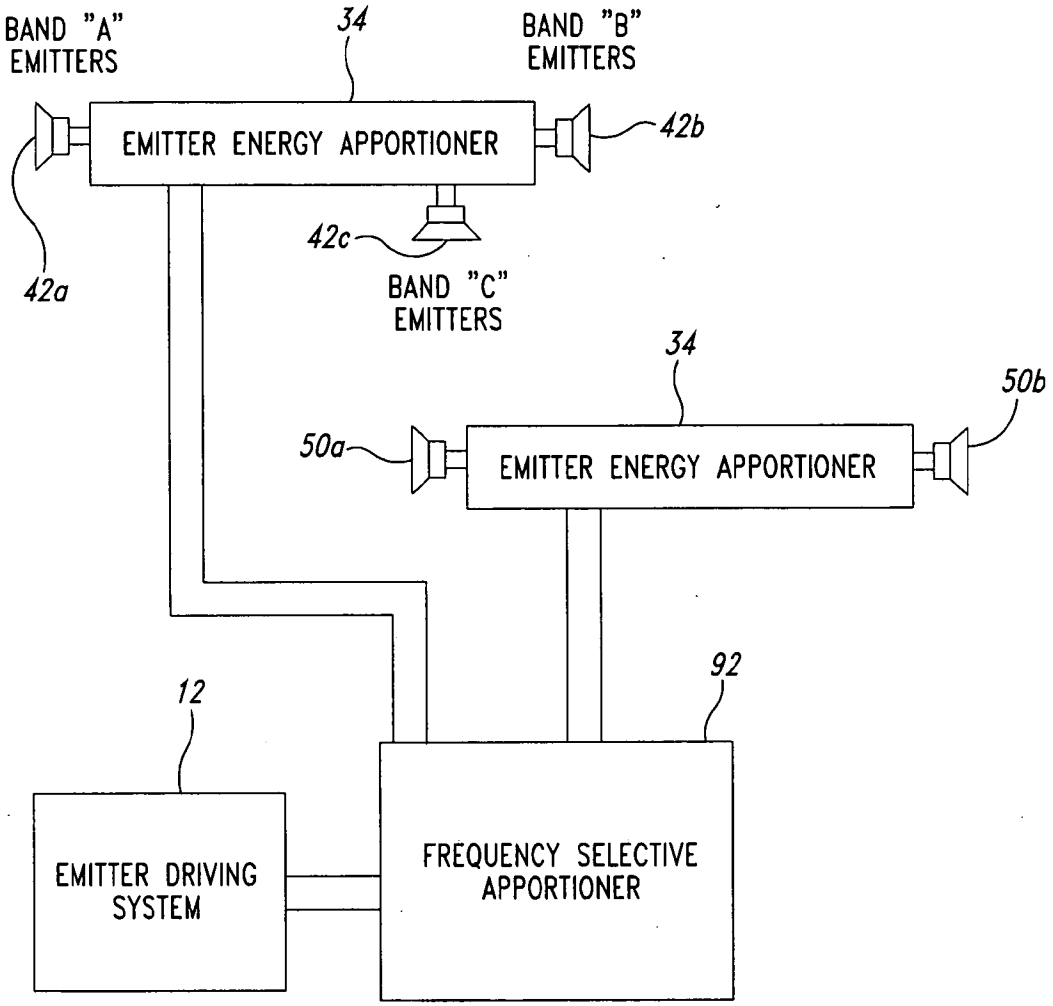
BAND "A" EMITTERS
34
BAND "B" EMITTERS
EMITTER ENERGY APPORTIONER
42b
42c
42a
BAND "C" EMITTERS
34
50b
50a
EMITTER ENERGY APPORTIONER
92
12
EMITTER DRIVING SYSTEM
FREQUENCY SELECTIVE APPORTIONER

Fig. 14

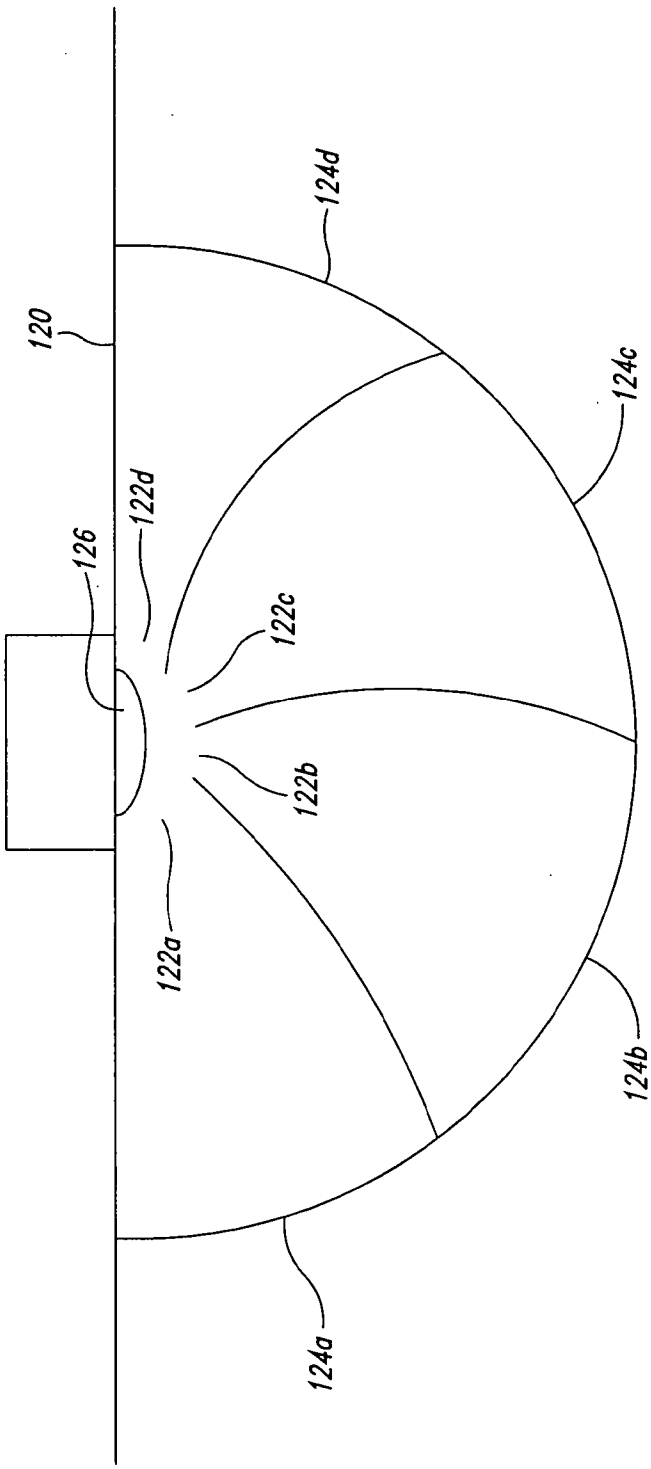

Fig. 15

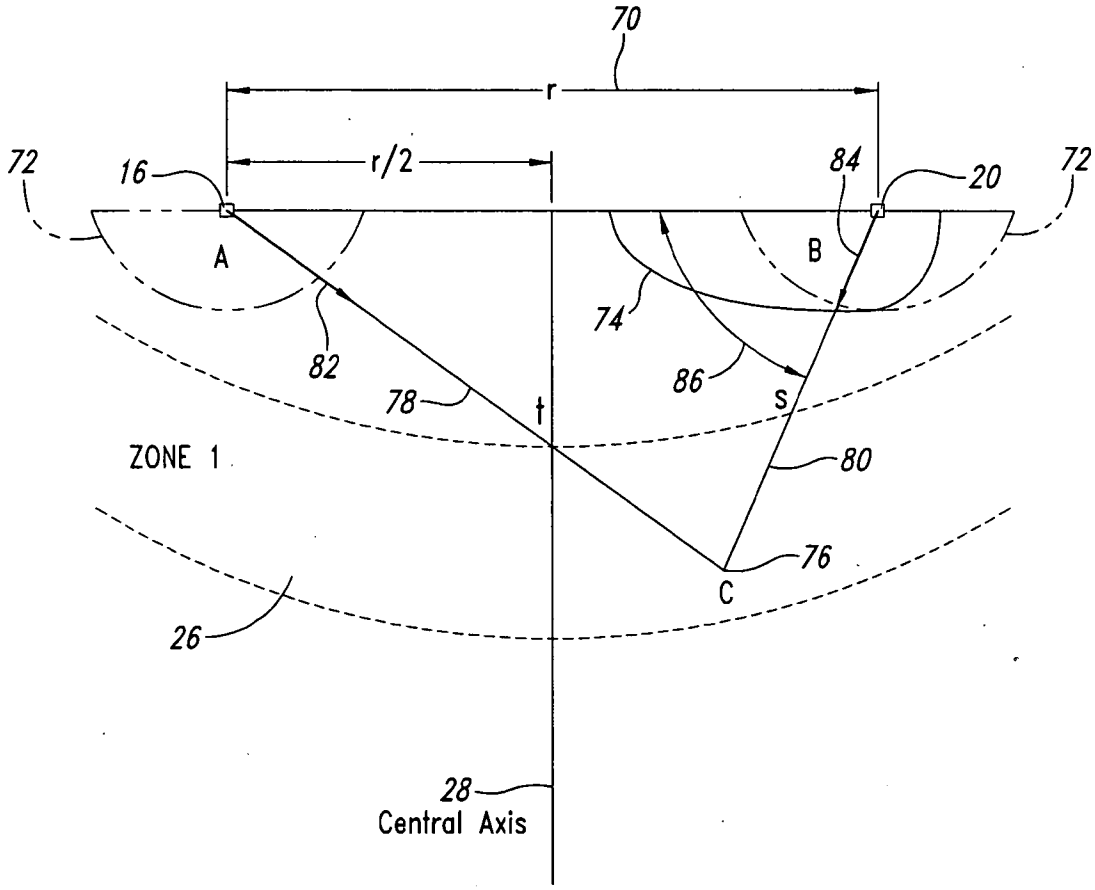
70
r
r/2
72
16
84
20
72
A
B
74
82
86
78
t
S
ZONE 1
80
76
C
26
28
Central Axis

Fig. 16

PTO/SB/01A (05-03)
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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	METHOD AND APPARATUS FOR SPATIALLY ENHANCING THE STEREO IMAGE IN SOUND REPRODUCTION AND REINFORCEMENT SYSTEMS

As the below named inventor(s), I/we declare that:

This declaration is directed to:

- [X] The attached application, or
- [ ] Application No. _____, filed on _____,
  - [ ] as amended on _____ (if applicable);

I/we believe that I/we am/are the original and first inventor(s) of the subject matter which is claimed and for which a patent is sought;

I/we have reviewed and understand the contents of the above-identified application, including the claims, as amended by any amendment specifically referred to above;

I/we acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me/us to be material to patentability as defined in 37 CFR 1.56, including material information which became available between the filing date of the prior application and the National or PCT International filing date of the continuation-in-part application, if applicable; and

All statements made herein of my/our own knowledge are true, all statements made herein on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001, and may jeopardize the validity of the application or any patent issuing thereon.

FULL NAME OF INVENTOR(S)

Inventor one:	**Baron C. Dickey**	Citizen of:	**United States**
Signature:	Baron C. Dickey	Date:	9/8/04
Inventor two:		Citizen of:	
Signature:		Date:	
Inventor three:		Citizen of:	
Signature:		Date:	
Inventor four:		Citizen of:	
Signature:		Date:	

- [ ] Additional inventors are being named on _____ additional form(s) attached hereto.

Burden Hour Statement: This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is used by the public to file (and the PTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This form is estimated to take 1 minute to complete. This time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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PTO/SB/81 (06-03)
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POWER OF ATTORNEY and CORRESPONDENCE ADDRESS INDICATION FORM

Application Number	
Filing Date	
First Named Inventor	Baron C. Dickey
Title	METHOD AND APPARATUS FOR SPATIALLY ENHANCING THE STEREO IMAGE IN SOUND REPRODUCTION AND REINFORCEMENT SYSTEMS
Group Art Unit	
Examiner Name	
Attorney Docket Number	60399-3

I hereby appoint:

☒ Practitioners at Customer Number: 22504

OR

☐ Practitioner(s) named below:

Name	Registration Number

as my/our attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the Patent and Trademark Office connected therewith.

Please recognize or change the correspondence address for the above-identified application to:

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Address					
City		State		ZIP	
Country					
Telephone		Fax			

I am the:

☒ Applicant/Inventor.

☐ Assignee of record of the entire interest. See 37 CFR 3.71.
Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96).

SIGNATURE of Applicant or Assignee of Record

Name	Baron C. Dickey		
Signature	Baron C. Dickey		
Date	9/8/04	Telephone	

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below*.

☐ *Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.131 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

APPLICATION DATA SHEET

Application Information

Application number::	
Filing Date::	
Application Type::	Regular
Subject Matter::	Utility
Suggested classification::	
Suggested Group Art Unit::	
CD-ROM or CD-R?::	None
Number of CD disks::	
Number of copies of CDs::	
Sequence submission?::	No
Computer Readable Form (CRF)?::	No
Number of copies of CRF::	
Title ::	METHOD AND APPARATUS FOR SPATIALLY ENHANCING THE STEREO IMAGE IN SOUND REPRODUCTION AND REINFORCEMENT SYSTEMS
Attorney Docket Number::	60399-3
Request for Early Publication?::	No
Request for Non-Publication?::	No
Suggested Drawing Figure::	
Total Drawing Sheets::	16
Small Entity?::	Yes
Petition included?::	No
Petition Type::	
Licensed U.S. Gov't Agency::	No
Contract or Grant No::	
Secrecy Order in Parent Appl.?::	

First Applicant Information

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Primary Citizenship Country::	US
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Country of mailing address::	US
Postal or Zip Code of mailing address::	98040

Correspondence Information

Correspondence Customer Number::	**22504**

Representative Information

Representative Customer Number::		**22504**

Domestic Priority Information

Application ::	Continuity Type::	Parent Application::	Parent Filing Date::
This application	An Application claiming the benefit under 35 USC 119(e)	60/539,430	01/26/04

Foreign Priority Information

Country::	Application number::	Filing Date::	Priority Claimed::

Assignee Information

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Street of mailing address::	
City of mailing address::	
State or Province of mailing address::	
Country of mailing address::	
Postal or Zip Code of mailing address::	